

*Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.*

—Wordsworth.

SPRING
1939

SMOKELESS AIR

Vol. I. No. 1

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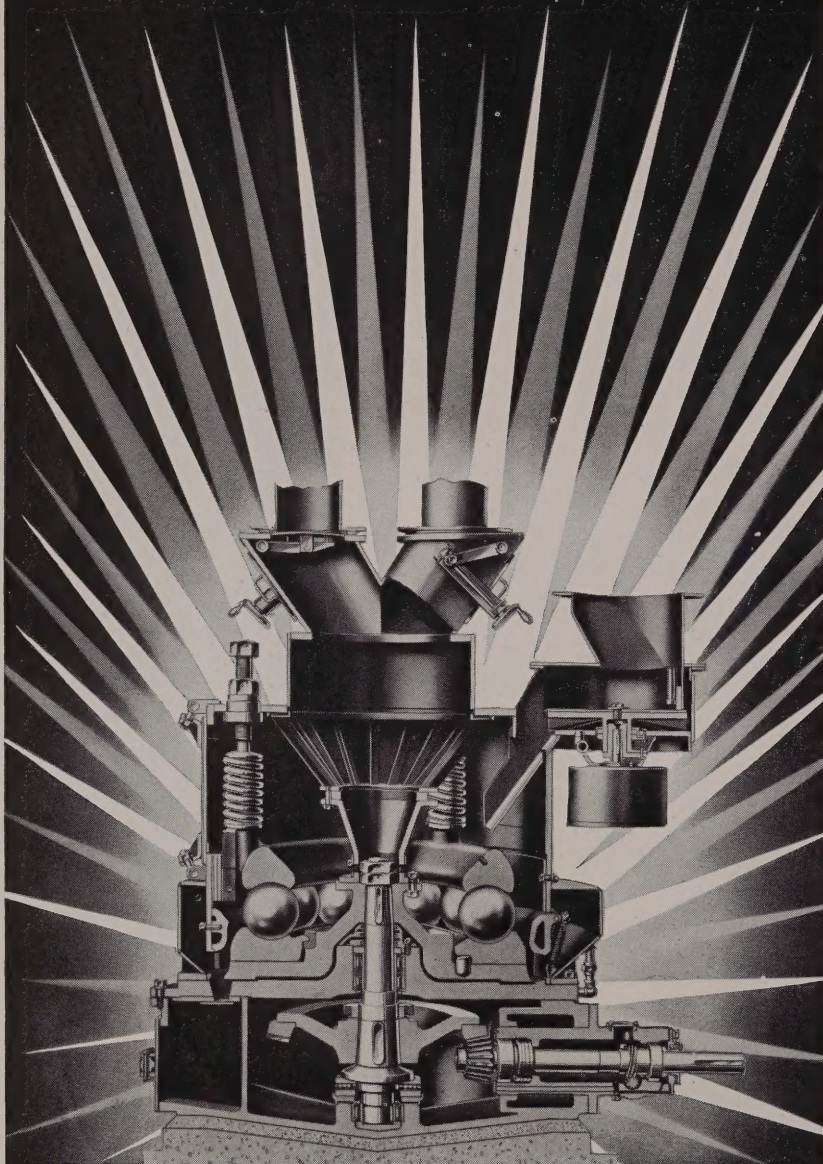
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THE NATIONAL SMOKE ABATEMENT SOCIETY.

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TOWARDS SMOKELESS AIR

Another Step Forward

FOR nine years the "Journal of the National Smoke Abatement Society" has been reporting all the news and describing and commenting upon all the developments and discussions of the smoke abatement movement in this country. It has been a modest and, within its limits, a successful publication, even if it has done little more than to keep together and inform the members and friends of the Society.

But the smoke abatement movement has gradually been developing, and little by little, year by year, there has been a growth that can to-day be seen to be leading to an entirely new phase. From being a matter of minority interest only the question is receiving ever-increasing public attention, and from this stage, if the work is sustained, it will pass into a final stage of general conviction and action. And that will be the end of the smoke age.

To say "if the work is sustained" implies more than may at first be appreciated. It means not merely sustaining the Society's work at its present level, but extending it very considerably. The growth of the Society must keep pace with the growth of the interest and support for smoke abatement. A small organisation can reach the first few thousand people, but a far bigger, far more active and vigorous organisation is needed to reach the first few millions.

A Winning Cause

We at last know that we are at the beginning of success, and have the pleasant feeling that the movement is "getting on" and has the appearance, as one newspaper has put it, of being a winning cause. But this, as far as really effective smoke abatement is concerned, is of value only because it brings a little nearer the next stage.

The development of the campaign to cope with the next stage is a considerable problem in itself, but it is being started, and this new magazine is one of the first steps to be taken. *SMOKELESS AIR* will continue to do all that the "Journal" did, but will do it better and more interestingly. It will also seek to interest those who have not before been interested, and to attract in order to convince.

As at Hollywood, new clothes and a new name have been given in order to attract, and it is hoped that these changes will be welcomed by members of the

Society and the many other readers. We think they will appreciate the need for these changes and for the other improvements that will help to produce a brighter and more compelling publication. The changes will be apparent to those familiar with the "Journal"—better paper, larger pages and type, more illustrations, and a better, more spacious layout.

SMOKELESS AIR is being published directly by the Society and not, as before, on our behalf. With our income at its present level it would not be possible to publish a magazine of anything like the same size or quality without the advertisements, which are now also being handled directly by the Society. This means more work at Chandos House, but it is worth it. An improvement that *will* be welcomed is that no longer will every left-hand page be an advertisement, which, by adding to the quality of the production, will benefit the advertisers themselves as much as anyone.

Many Interests

One ever-present difficulty remains: our readers differ so widely in their interests. Some are technical people, interested in scientific and industrial developments; others are concerned with legal, local government and similar matters, and are used to "heavy" reports and records; while others, our valued "lay" members, may have few or no interests of this kind, but are members simply because they want to help us to get rid of smoke, and want the magazine to give them news of what is happening. And then there are the readers whose first interest in the subject can be stimulated and developed by information that will certainly not be "news" to many others. All we can do is, like the B.B.C., to ask everyone to tolerate what is meant for someone else.

It is hoped that *SMOKELESS AIR* will come to be looked upon not as the organ of the Society, but as the general publication for all activities and developments that are helping to reduce atmospheric pollution. It was nearly called "Smoke Abatement News," and that is what it will be.

One last word: we should like every reader to write and tell us his or her opinion of the new magazine. Bouquets are pleasant, but brickbats will be more useful!

DOWN THE BARGOED MINE

Two Accounts of the Colliery Visit during the Conference at Cardiff

I. *A Personal Impression*

by *Marjory F. Des Vœux*

I THINK that December 1st, 1938, is a date which will stand out in the memories of many of us for a long time—certainly it will in mine.

In company with many members of the N.S.A.S., we left in a motor coach from Cardiff at 2.40 on the Thursday afternoon to visit the Powell-Duffryn mine. Unfortunately the rain fell heavily all the afternoon, which quite spoilt our country drive, but as everyone was in good spirits the hour's drive seemed quite short, and we arrived at the Bargoed Valley just before four o'clock.

There we were welcomed by our hosts who conducted us down a very steep hill, and still steeper steps and taken to the rooms provided at the pit-head for both men and women to don the garments suitable for descending the mine. Basins with hot and cold water were provided and dressing-rooms; and lying about in the rooms were masses of men's trousers and jackets, helmets and pit-lamps.

There were only two other ladies in the party besides myself, and amidst much laughter we donned our trousers over our day coats and skirts which did not at all add to the beauty of our figures. Round our heads we put towels, and perched on the top were our helmets. We felt the men had a great advantage over us as regards their dress. However, they were most kind and did not betray by their faces what they really thought.

Down the Mine

The distance down was nearly half-a-mile, and then we stepped out into another world—a world of black roads and black walls lit up every few yards by electric lamps.

At first it was easy going, as we could walk upright, and it was not hot—we could feel the air that was being pumped down the shaft; but later we had to turn off the main road, stoop down and walk along a rather hot and stuffy passage until we came to the seam where the men were working. Unfortunately we did not

see the men at work as they worked in two shifts a day, which meant no afternoon work.

Several times I was very glad of my helmet when my head hit sharply against the roof as I crouched along.

We were shown how the drills worked along the walls, and in these modern days when the men have numbers of drills working in a row about five feet apart, one can imagine the terrible noise, added to the awful discomfort of working in a crouching position and at times on one's back. We were told that when the men get home their wives often have to pick out of their bare backs the small pieces of coal that have got pressed into their flesh whilst working. I am sure that many of us felt that a miner earned every penny of his wages, and could understand how at times he demanded more.

Unfortunately, we could not see the four ponies which worked in the mine, as they were stabled in another part.

We then went up again in the lift and were taken back to the dressing-rooms, where on looking in the mirrors we scarcely recognised our own faces—we were so black. However, our hosts had provided everything we could wish for. Drinks were offered all round, and after partially cleansing ourselves, we were taken up the steepest steps I have ever climbed to the Works Offices, where a delightful tea was provided for us.

The N.S.A.S. were in Cardiff for three days, and at the end of our visit we all felt that greater hospitality could not have been shown to us, and we were much indebted to all those who had so kindly arranged this visit to the mine.

II. *An Official Description*

BARGOED Colliery, which was visited by members of the National Smoke Abatement Society, is situated some seventeen miles north of Cardiff in the Rhymney Valley.

The colliery has two shafts, but it is only through one of these that coal is brought to the surface. This shaft, which was the one descended by the party, is 625 yards in depth, and a daily quantity of approximately 1,600 tons of steam coal is raised through the shaft.

The Seven Feet, Upper Four Feet and Three-Quarter seams are worked and it was the coal face in the latter seam that the party visited. A number of the coal faces are cut by means of mechanical coal cutters driven by compressed air, and all coal is mechanically conveyed by means of belt and jigger conveyors to the trams which are, in turn, drawn by steel wire ropes operated by stationary compressed air or electric hauling engines over rail tracks to the pit bottom, from where it is raised to the surface by means of cages. The cages in the shaft are used to lower and raise men, coal and materials and are operated by steam winding engines of a horse power of 3,000 and developing a maximum rope speed of 68 feet per second. The steam for the engines is generated by a range of six Babcock & Wilcox water tube boilers situated near the engine house.

There are approximately fifteen miles of roadway at this colliery, practically the whole of which is supported by means of steel arches. The ventilation of the underground workings is affected by means of a large steam driven fan, the impure air from the workings being drawn up one shaft by this fan thereby allowing the pure air to be drawn down the other shaft.

Surface Work

The area of ground occupied by the Company's works at Bargoed is very considerable as, apart from the screens and coal cleaning appliances attached to Bargoed Colliery, there is also another colliery nearby known as Bargoed Brithdir Colliery, which works the bituminous coal. Furthermore, there are also at Bargoed three large coal washeries, where coal from Bargoed and other collieries is washed and sized. The smallest sized coal known as Washed Duff is used in the making of coke at the four batteries of coke ovens at Bargoed capable of producing up to 6,000 tons of coke per week, with all the attendant bye-products, such as Benzole, Sulphate of Ammonia, etc.

The Company's largest Power Station is at Bargoed and generates 85,000,000 units of electricity and 31,020,000,000 cubic feet of compressed air per annum, which conveys an idea of the size and capacity of the Station. The electricity is conveyed by means of overhead and underground lines to Bargoed Collieries and Works, and also to the Company's other collieries in the Valley, whilst the compressed air is conveyed to the same works and collieries by means of overland steel pipe lines.

Science Looks Ahead

PROFESSOR J. D. Bernal, F.R.S., of Cambridge, in his recent book "The Social Function of Science," surveys science as it is to-day and as it should be if it is to develop, as it can, as an agent in the service of a rational civilisation. Two paragraphs from the book must be quoted. Under "Science in the Service of Man" (p. 351) Professor Bernal writes :

"The services attached to buildings have in the past only too often been afterthoughts ; in rational architecture they will become essential parts. Given good insulating walls, the problem of heating houses entirely disappears. Indeed, even in winter, the heat generated by the inhabitants of the houses would require some method of cooling to get rid of it. To secure this degree of self-sufficiency, however, it would be necessary to devise a rational ventilation system which did not, as at present, take in air cold and send it out hot, but arranged for the outgoing hot air to warm the incoming cold air in winter-time and vice versa in summer. The domestic fire would then become of purely ritual importance. If such complete segregation from outside air was not required, and it would not be for many country houses, both heating and cooling would still be necessary, but this could be achieved without the expensive means used to-day. Already reversible heat engines which would pump heat into a house in winter and out in summer have been run on one-third to one-fifth of the cost of direct heating methods."

Waste Prevention

And again, discussing "Wastes" :

"The chemical industry needs to concern itself with the disposal of waste as well as the production of new substances. At present we are throwing away an appreciable proportion of consumable materials and doing so in a way which destroys the amenities of country and town alike. To a large extent this is a problem of social organisation and control, but the chemical industry can provide the means of making the control effective and valuable. Smokes and noxious dusts and gases are some of the major sources of depression and ill-health in all urban districts. Most of them could be stopped at the source by the use of suitable fuels and preparative processes, and the rest could be collected electrically or otherwise. Such processes, though always from the point of view of the community, are productively efficient only for large units, and consequently the effect of prohibition

(Continued on page 15)

THE CHARING CROSS EXHIBITION

Clearing Smoke from the Air



(by permission of the L.P.T.B.)

A General View

The Society's Exhibition at Charing Cross Underground Station was in every way successful. It was crowded for the opening on 28th November by the Rt. Hon. Herbert Morrison, M.P., and the interest of the public was made clear by the dense crowds which, at the busy periods, made it difficult to see anything. Especially popular was the "miracle," in which a model of a smoky and dirty town changes mysteriously into a new, gleaming, smokeless town, and to see this there was often a patiently waiting queue. One of the most telling exhibits appeared to be one of the simplest—the inset model of a house, with a plain brass plate on the fence at the front: "Mr. and Mrs. Everyman, Makers of Smoke."

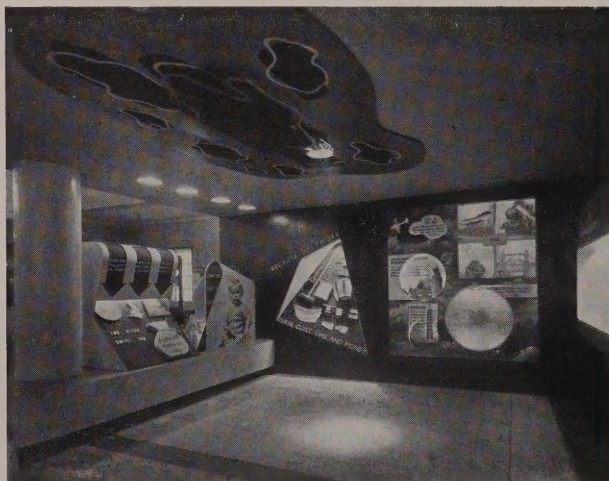
The Exhibition was designed by Messrs. Mischa Black and F. H. K. Henrion, who fully deserved all the compliments they received. The Society is very grateful to the Gas Light and Coke Company for preparing and loaning to us the material and to the London Passenger Transport

Board for allowing it to be used on what is now one of the best-known and valuable exhibition sites in London.

The Exhibition proved beyond all doubt that smoke abatement can be presented to the public in a dramatic and interesting way without any need for crude exaggeration, and that it has a surprisingly strong popular appeal. Our one regret is that we have not, as yet, the resources to maintain exhibitions of this type and to arrange for them to tour the whole country.



Mr. Morrison chats with a chimney-sweep after the opening



Another view of the Exhibition.

Regional Committee News

This section of each issue reports the activities of the eight Regional Committees now established

The West Riding

At a recent meeting of the Executive Committee a letter was read from the Sanitary Inspectors' Association informing them that they were considering the byelaws under the Public Health Act, 1936, with special reference to smoke abatement. A sub-committee was formed of some of the members of the Executive Committee, and pursuant to a resolution of this sub-committee a letter was sent out asking the constituent authorities if they were agreeable to a uniform byelaw of two minutes for the emission of black smoke being adopted throughout the area. The majority of these authorities have replied saying that they are putting the matter before the next meeting of their respective Councils.

A further report will be made after the sub-committee has considered the replies from the Councils concerned.

Greater London

The Greater London Advisory Council for Smoke Abatement has so far little to report, but is holding a meeting on 29th March to consider and adopt a constitution drafted by a representative committee set up for this purpose at the inaugural meeting. The Greater London area includes about 100 local authorities and so far about 45 have signified their intention of becoming members of the Council. The remaining authorities will be approached again as soon as it is possible to place before them a definite constitution. The annual subscriptions agreed upon are two guineas for each authority except the County Councils, which is three guineas and four guineas for the L.C.C. The Executive Committee, as proposed, will include representatives appointed by each County Council and by the Metropolitan Boroughs Standing Joint Committee, and members elected by the representatives of the other authorities in each of the different counties.

The meeting on 29th March will be held at the Ministry of Health and will be addressed, before the business is taken, by the Minister, the Rt. Hon.

Walter Eliot, M.C., M.P., and the Leader of the London County Council, the Rt. Hon. Herbert Morrison, M.P.

West Lancashire and Cheshire

The Smoke Abatement and Fuel Economy Class held at the School of Hygiene, Liverpool, has been well attended during the winter session. Forty-five students enrolled for the course and since the commencement of the class six years ago, over 400 students from most of the large firms in the area have attended the lectures. Experience has shown that the majority of the firms in the Liverpool area are co-operating and it is appreciated that in regard to industrial smoke abatement, manufacturers are willing to follow suitable suggestions for efficient and smokeless working of their industrial furnaces.

By means of the automatic air filter a series of measurements of atmospheric pollution in the vicinity of railway tunnels and openings have been obtained. The results have been compared with measurements obtained in other districts not directly affected by railway smoke. The railway company is at present trying a series of experiments in regard to the firing of railway locomotives with the object of mitigating the nuisance. Measurements are being continued to ascertain if improvement is being effected.

In the Liverpool area the gas and electricity industries have shown considerable increases in the consumption of their products during the past year. The demand for solid domestic fuel in Liverpool during the winter months is approximately 17,000 tons per week and the demand for solid smokeless fuel is approximately 3,500 tons per week. The sale of solid smokeless fuel is steadily increasing.

During the last 3 years there has been a remarkable increase in the number of small mechanical stokers adapted to vertical and locomotive type boilers, process work and central heating plant. Approximately 130 of these stokers have been fitted in this area and in Liverpool over 50% of the laundries have had them installed. These machines are all of the "under feed" type, and automatic in operation. The correct setting of the controls ensures smokeless combustion.

Sheffield, Rotherham & District

The 8th Annual Report of this Committee, the only statutory smoke abatement committee, is a record of thorough and effective smoke prevention work.

(Continued on page 21)

SOME RECENT PAPERS

Five Papers of interest have been read at recent conferences and meetings. As all should be reported only brief accounts of each are possible.

Welsh Coals for Open Fires

DR. Margaret Fishenden, who became known through her work on the open fire, read a paper to the Institute of Fuel on 10th November, 1938, in which were described tests on grates, designed for the burning of coke, of anthracite and other smokeless Welsh coals. The grates used were the well-known standard makes, and comparative tests were also carried out with bituminous coal and open-fire cokes.



Dr. Fishenden

The fires were usually lit by gas in the ordinary way, and the performance of the fires were determined by measurements of the radiation emitted into the room throughout the run. The Fuel Research Station water-flow radiometer was used.

Curves showing the variation of the radiation intensity with time from the lighting of the fire were plotted, and from these the total radiation received by the radiometer during the life of the fire was obtained. Allowing for the unconsumed fuel, figures were obtained for the radiation per pound of fuel burned, and the time to reach a certain intensity of radiation was noted.

It was found that the radiation per pound of coal burned was slightly higher from the medium volatile coals than from anthracite, that both were superior to bituminous coal, and that an advantage of about 1 per cent. was obtained over the best quality open-fire coke and 16 per cent. over other cokes. With gas for ignition the fires burned up most quickly with best quality coke, but the coals were superior to the other cokes. When ignited with wood the coals burned up even more quickly than the best quality coke ignited by gas. Anthracites left a higher percentage of unburned residue, but this could be used for lighting subsequent fires.

It is concluded that South Wales coals, over the

whole range examined, are in every way suitable for use in open grates designed for burning gas coke.

The experiments were carried out by Mr. R. F. Jennings.

The Design of Open Fires

A very interesting and potentially valuable research on the design of open fires has been carried out by Professor O. P. Rosin, and is described in a paper entitled "The Aerodynamics of the Domestic Open Fire," read to the Institute of Fuel on 9th February, 1939.

The research examined the design of the grate and chimney from the point of view of the airflow required for combustion and ventilation, and is notable for the way in which comparisons with actual conditions have been made possible by means of ingenious models. A model embodying the essential features of the domestic fireplace and chimney was constructed of celluloid. By inverting this and allowing a carefully controlled flow of water to pass through it the flow of air was simulated, the downward flow of water corresponding to the upward flow of air. The movement of the stream was made visible by dyes inserted into the tank which corresponded to the room, and the rate of combustion was compared by the rate of solution of compressed salt briquettes affixed to the grate.

The characteristics of the flow and the formation or disappearance of eddies under varying conditions were observed and have been recorded in a film. By means of the model it was thus possible to investigate the effect of different firebacks, chimney-breasts, throats, etc. The equivalent of different rates of air-change in the room was also observed.

It was found that the best results are obtained with a "streamline" chimney, with no smoke shelf or discontinuous contractions and no expansion angles greater than 12° . A narrow chimney of 20 sq. inches is sufficient to take up and convey the combustion gases of an open fire—the gases, if left alone, cling to the back wall and require only a small fraction of the cross-section of wide chimneys. There should be a weir-shaped chimney breast without a canopy. Both

for airflow and heat distribution a convex fireback is preferable to other shapes.

The hearth-bottom and stool grates are discussed in light of the experiments. In the former it is pointed out that the rate of combustion is not controlled by the airflow, as in other combustion appliances, but the airflow is controlled by the rate of combustion, which is, in this case, exclusively a function of the fuel, its size, arrangement, and temperature. With a stool grate the rate of burning is controlled by the intensity of the airflow, so that the rate of burning can easily be regulated by a good fret to cut off or adjust the air supply under the fire.

Anthracite Duff

A paper on the use of this fuel for steam-generation was read by E. B. Johnson, A.M.I.Mech.E. at a meeting of the Institute of Fuel on 24th January, 1939. The possibilities and advantages of this fuel for pulverised fuel-fired boilers and on chain-grate stokers are discussed. For satisfactory operations on duff a boiler should incorporate certain well-defined features, but practically any type of boiler can handle quantities of up to 70 per cent. of this fuel in conjunction with a higher volatile coal.

Apart from reduction in steam costs unexpected advantages have been obtained by the use of blends. For example, in one case excessive swelling of the higher volatile coal almost disappeared, ensuring a more uniform firebed and a marked reduction in the unburned carbon in the ash refuse. Owing to the higher average ash content, ash and clinker prevented direct contact between the grate and burning fuel in the region of active combustion and a protection against direct radiation at the back. By this means the grate ran cooler while the smoke emission was reduced to little more than a haze.

"This last-named characteristic of anthracite," the paper continues, "is employed to minimise smoke emission from the use of bituminous coal in certain American locomotives and might well be given more serious consideration by our own smoke abatement enthusiasts."

The Coal Convention

Two of the papers read at the Coal Convention in London on 23rd and 24th November are related to smoke abatement. Or rather, one to smoke abatement and one to smoke production. The latter was a paper by Dr. Marie Stopes, on "The Coal Fire." Apart from a few interesting remarks on the design of

grates this was eulogistic in sentiment and lyrical in expression. Under this description must fall the discussion upon the "subtle, minute in amount, yet potent, magnificent in result," emanations from a glowing coal fire to which the name "bio-vitric rays" are provisionally given by Dr. Stopes.

This "power of healing, this vital radiance," is stated not to be present in the bright flames flickering over black lumps of coal, but to radiate only when the coal is in a state of "ruddy incandescence." In other words, when the coal has distilled itself (in a shockingly bad way) to the equivalent of a smokeless fuel. Thus this latest, and apparently deepest, virtue of the coal fire is nothing that cannot be obtained by the use of other fuels.

Dr. Stopes, concerned though she is for health, does not seem to have seen or heard anything about the smoke produced by the coal fire. She describes the health-giving effects of lying naked before a radiant fire after illness, and may know the value of the undoubted "bio-vitric" rays of the warm sun in early spring. But has she ever lifted her face to the smoke-dimmed sun of our large cities at such a time and felt, at once, how much of its pulsating power was missing?

Also read at the Coal Convention was a paper on "Practical Smoke Abatement with Solid Fuel," by Arnold Marsh, in which the solid smokeless fuels were described and discussed and the means indicated by which bituminous coal could be used smokelessly. The domestic problem was analysed and it was shown that its solution depended upon considerably increased supplies of semi-coke for use in existing grates and ranges, an extended adoption of modified grates and ranges, and increased supplies of the less free-burning fuels suitable for such appliances. Both classes of development were necessary and were not exclusive, and there was ample scope for all the fuels. It was concluded that some degree of co-ordination and the planned use of the fuels for their most appropriate purposes was desirable.

Science Looks Ahead—continued.

of smoke and dust and gas emission would be concentrate plants liable to produce them into large units. This would lead to further economies in the recovery of useful by-products. Almost as much corrosive sulphuric acid goes into the air with smoke as that produced by the whole of the chemical industry. The domestic fire is in England the chief offender. Only an extension of the use of smokeless fuel, pending a reorganisation of housing and domestic heating, can remedy this nuisance."

C O M M E

THE members of the Society who were asked to give their opinions on the new title of the Journal will be interested to know that more votes were given for *Smokeless Air* than any other two suggested titles put together. One in three preferred this name, and next in popularity were *Smoke Abatement* and *Smoke Abatement News*; after these, *Clear Skies*. It will be seen that these preferences have all been met, as far as possible, by calling the magazine *Smokeless Air*, bringing *Smoke Abatement* into the sub-title, and designing a cover which indicates clear skies! None of the other titles found much favour, and although the suggestions made by many members were carefully considered by the Committee, none of them seemed quite so suitable, taking all factors into consideration, as the one chosen.

* * *

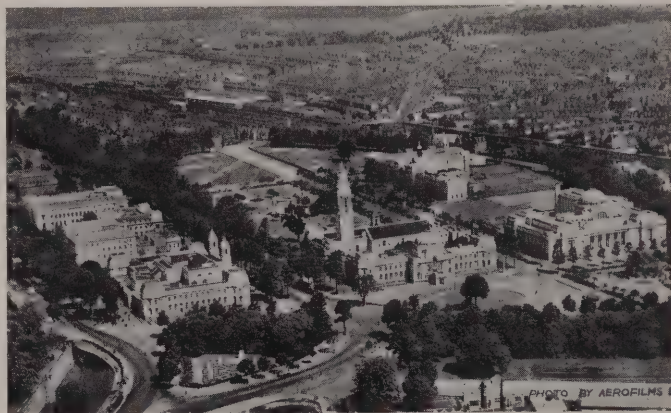
The Cardiff conference, postponed from "crisis week" in September, took place at the beginning of December, and in spite of all the difficulties due to the change, was successful in every way. The visit to the coal mine is described on another page, and the papers and business transacted is recorded in full in the "Proceedings" of the conference, published at 1s. Both the main sessions promoted lively and informative discussions, and especially valuable was the discussion on burning spoilbanks at the Annual Meeting, where we heard first-hand evidence from speakers who were "up against" the problem.

* * *

As social events are not recorded in the "Proceedings," mention must be made here of the reception at the City Hall by the Lord Mayor, at which a real Welsh welcome was given by a women's choir, which can be praised enough by saying that it was of the standard one expects from Wales. The conference concluded with a luncheon given by the Monmouthshire and South Wales Coalowners' Association, the excellence of which did nothing to diminish the excellence of the speeches which followed. We went to Cardiff to make South Wales smoke-conscious, and although we think we did this to some degree, we know we came back having been made South Wales-conscious.

Cardiff looks upon itself as one of the least smoky cities of the Kingdom, and the appearance of its buildings, as well as its atmospheric pollution records, confirms this. The fogs of Cardiff are rare, but they say that when they do come they are clean and white. We lost a lot of publicity through not being able, for once, to say something salutarily rude about the grime of the town, but it would at the same time be unwise to let Cardiff get the idea that she has no smoke problem to speak of, and that there is no need to show any determination about what there is. The sootfall may be only half that of other cities, but it is at least twice as great as it ought to be.

* * *



Cardiff, showing the Civic Centre.

The resolution on burning spoilbanks passed at Cardiff was in support of the Bill now before Parliament, and included a request for similar support from the local authorities affiliated to the Society. Copies were accordingly sent to these authorities and it has been gratifying to note how many of them have endorsed the resolution and have sent similar resolutions to their local members of Parliament and to the Government departments concerned. This was expected from authorities in and near the mining areas, but it has been done with equal readiness by authorities in, for example, London and on the south coast, where it is unlikely that the problem had even been heard of before. Such welcome co-operation indicates a new and valuable understanding of the need for concerted national effort to tackle all types of pollution problem.

N T A R Y

For some years the Society has, directly and indirectly, drawn attention to the fact that although Parliament has passed legislation to reduce smoke, that the need for smoke abatement has been expressed as strongly as possible by a Departmental Committee, and that the evil has been condemned by Ministers and in official reports, Whitehall has been notorious for the volumes of smoke emitted from its open-fire chimneys every morning. It was therefore a signal success when the First Commissioner for Works stated in the House that 7,000 fires were to use smokeless fuel this winter and that the fuel used for other purposes was either smokeless or would be burned under conditions that ensured smokelessness. Whitehall is "Blackhall" no longer!

* * *

Another resolution, adopted at Cardiff, which is being sent out with an explanatory memorandum, asks local authorities what *they* are doing to set their own property in order and to act on their responsibility for smoke abatement by setting an example for others to follow. There should be no smoke from any source from the chimneys of town halls and other municipal buildings anywhere, and if there is, it is, in John Evelyn's phrase, a thing we justly deplore.

* * *

The snapshot of a corner of Ilfracombe reproduced on this page was sent to us by an indignant visitor to that otherwise delightful resort, and is a typical example of how the beauty and freshness of our seaside can be marred by the smoke which people, however unconsciously, seek to escape from during their brief holiday weeks. It gives point to the question of smoke abatement in health resorts which we are to discuss at the 1939 conference in Blackpool in September. We are not going to Blackpool because it needs our attentions any more than any other seaside town, and the choice might just have well have been on the East or South coasts (or the North Wales coast, where the railway runs just behind the promenades!) or even at one of the inland spas.

* * *

We should, however, like some information of the atmosphere of Blackpool and other Lancashire coast towns when a slow wind blows from the east, from Lancashire's densely-populated industrial zones. We



Far from the Smoke?

have been told that such a wind blackens the sheep on the Isle of Man, so what does it do to Blackpool, Fleetwood, Lytham-St. Annes, or Southport?

* * *

Many of the Society's members are women, and it has been suggested, rather timidly, that to ensure their interest in the magazine we should follow the example of

so many other publications by having a women's page. Candidly, it seems rather difficult (although we are open for suggestions), but at any rate here is one paragraph that may interest them. A few people thought that some of the photographs in "Britain's Burning Shame" showing the effects of smoky coal fires in the home were exaggerated, but the personal testimony of people (especially housewives) who have had experience of both these and smokeless fires confirms that there was no exaggeration. An interesting and authenticated point is that of a maid who commented upon the fact that her hands remained far cleaner and softer than those of her two sisters who were maids in similar houses, doing similar work. The only difference seemed to be that in the one case smokeless fuels only were used, and in the other cases they were not. When this was pointed out to her the girl realised that doing the fires, dusting and cleaning rooms did not dirty her hands, and that the little dust there was was never sooty and sticky. *It's the soot that makes the dirt.* Tell this to your unconverted friends!

* * *

We regret an unfortunate printing error in a review of a publication of Messrs. Eva Stoves Ltd., in the last issue of "The Journal," in the course of which it was said that with a slow combustion stove the room and its walls and furniture become and remain "uncomfortably" instead of "comfortably" warm.

Reports of Progress in the industries concerned with smoke abatement will be published under this heading each quarter. All the articles are contributed on behalf of representative associations and do not necessarily reflect the views or policy of the Society.

FUELS AND APPLIANCES

SOUTH WALES

By R. T. Evans, M.A., *Deputy Lord Mayor of Cardiff*

A FEW months ago Cardiff enjoyed the privilege of extending hospitality to the National Smoke Abatement Society. We welcomed the coming of the Conference because we knew that the city provided an emphatic vindication of the cause espoused so cogently and persistently by the Society.

So it is perhaps not altogether inappropriate that I, in my civic capacity, should write the first of a series of articles it is proposed to publish in this magazine on the problems of atmospheric pollution in their special relation to the South Wales Coal industry.

Cardiff as a commercial community is, of course, largely the creation of the mining industry, and Cardiff must never forget the debt it owes to its creator. Fluctuations in industrial activity in the valleys immediately reflect themselves in the general trading of the city.

Within the next two months, the Council will make a decision regarding the future of its transport. For over two years it has debated whether trolley buses or oil buses shall replace its trams. Members have been swayed now this way and then that by considerations of finance, amenity, national safety and so forth, but signs are not lacking that in the end the balance will be tipped in favour of electrically propelled vehicles by a sense of loyalty to the coal industry.

So with producer gas. It was the emergence of this new method of propulsion that caused the postponement of a decision regarding the replacement of trams. It was felt that there perhaps was the solution of our problem, namely, how to combine maximum mobility of transport with the interests of the coal industry. For the moment the proposal to spend £5,000 in acquiring two producer-gas buses so that a thorough trial should be undertaken hangs fire. It has not been abandoned, but it is felt that a little delay perhaps is advisable.

To the knowledgeable, discussion of forms of

transport is not remote from the problem of atmospheric pollution, and believe me, Cardiff has a definite and well articulated conscience on this matter. Do we not realise the extent to which the City's distinctiveness rests upon its magnificent silver grey civic buildings—a magnificence which would long ago have been tragically blurred were it not for the inestimable boon of a clean atmosphere that we enjoy?

In 1937, Cardiff topped the record for large British towns in the matter of hours of sunshine enjoyed. In 1938, it occupied a very high place in the list though Newport—another big Welsh coal using industrial area—beat it in that year by 58 hours.

But, all this apart, as might be expected in a metropolitan area that has long ceased to think only within the narrow limits of local interest, we are intensely proud that in the coalfields around us we have an incomparable product. But also we share the universal awareness of the menace of a filth laden atmosphere to health and amenity, and we realise the clamant need for strong action to remove this menace. We know too, that the extended use of non-smoke producing fuels—particularly for domestic purposes—is a reform for which we must unitedly press.

That in South Wales anthracite and coal with low volatile content we have almost the ideal fuel is a happy thought, but it is not the most important consideration now. As an economist and sociologist my concern is with the appalling waste of labour, money and life resulting from an atmosphere impregnated with deleterious matter. It is because I appreciate the blessing of Cardiff's clean air, that I wish the Society well in its campaign, and assure it of our most cordial support.

ELECTRICAL INDUSTRY

The tendency in the last few years has been for less and less smoke producing fuel to be used for domestic purposes. This is all to the good of smoke-abatement, since the domestic chimney has always been by far the greatest source of fumes and fogs in this country.

Some credit for this must be given to the electrical

industry when it is remembered that 200,000 housewives last year installed electric cookers, the large majority of these representing changes from other methods.

The fact that electricity is thus being used is tending to lessen the smoke pall that hangs over our cities. The same applies, even more strongly perhaps to the heating of water. Thousands of housewives still rely on old-fashioned methods of heating water which involve the burning of fuel and production of smoke.

Over 1,500 households, however, installed electric water heating appliances during every week of 1938—a considerable proportion being designed for continuous use all the year round. These, of course, are also helping immensely to solve the problem of smoke abatement.

During the cold spell at the end of last year, there was a tremendous increase in the use of electric fires. Electrical shops and stores, in fact, reported phenomenal sales and one London store placed its sale of electric fires as easily its biggest sales.

Here, of course, we come to the main sphere in which electricity helps smoke abatement. With electric fires which can be so easily brought into use, the tendency is increasing for smoke producing fires not to be lit so much in the household.

Experience shows that fogs which last all day are mainly caused by the lighting of fires early in the morning. The use of electricity will tend to encourage the housewife to delay lighting her coal fire until later in the day (if at all). The tendency to produce smoke will not be so great. This question of delaying the lighting of coal fires until late in the day is most important in analysing the cause of fogs in industrial centres.

Our climatic conditions are such, particularly in the winter months, that most mornings bring a pall of light mist over our buildings. This mist is clean and comparatively harmless and, if left alone, would soon be dissipated by the rising heat of the sun.

Early-lit coal fires, however, throw up tons of soot and smoke which rise above the white mist and then sit heavily upon it all day, preventing the sun from penetrating to the mist and dissipating it in the ordinary way.

If those fires were not lit till midday or late afternoon, the mist would have disappeared in the forenoon and there would be no dark pall hanging over our heads all day long.

The creation of smokeless zones for our large cities has been mooted and here again electricity can play an important part in attacking the problem at its root.

In New York, this has been done with great success but this scheme involves complete electrification of suburban railway lines—a programme long overdue in our towns. All trains, as in New York, should be turned over to electric traction at a radius of twenty or twenty-five miles from the centre of the city.

The lead which the Southern Railway has given in this connection, it may be mentioned, has not only proved useful from the point of view of smoke abatement, but has proved a great commercial success from the railway's angle as well. The improvement in cleanliness in areas enjoying electrified railways is most marked.

Thus, in the two most important fields of smoke abatement—domestic fuel burning and suburban transport—electricity is the faithful ally of the smoke abatement crusader.

GAS INDUSTRY

Achievements in overcoming the special difficulties of smoke abatement in the steel industry were discussed by Dr. H. A. Fells, Chief Research Chemist to the Sheffield Gas Company, in a recent address to the Yorkshire Junior Gas Association in Leeds.

Dr. Fells reminded his listeners that before gas-heated furnaces were introduced thousands of tons of coal were used in Sheffield every week in furnaces deliberately operated to produce black smoke—smoke encouraged in order to prevent scaling of the metal and surface damage.

Fortunately, furnace practice to-day is on a more scientific basis. With the realisation that black smoke is not essential for the production of steels, the Sheffield, Rotherham and District Smoke Abatement Committee has (as Dr. Fells pointed out) been very active in watching the progress made in installing new types of furnace and in using new types of fuel—particularly coke-oven gas.

The 1938 report of the chief smoke inspector for Sheffield, continued Dr. Fells, contained the statement that eventually the demand would probably result in the introduction of gaseous fuel-fired furnaces throughout the industry; then one of the principal sources of pollution would have disappeared.

Dr. Fells made a neat point as a rejoinder to those who have said that this expenditure on the installation of modern furnaces is philanthropy. "It is to increase output, improve quality, and reduce overall costs," he said. "That a contribution to the abatement of smoke has been made at the same time is merely a fortunate consequence, well worthy of proper men-

tion, but not to be claimed as a philanthropic act on the part of fuel users."

Progress in smoke abatement in the Potteries was detailed recently by Mr. A. Mackay, Chief Engineer and General Manager of the Stoke-on-Trent Gas Department.

Pointing out that the increasing local use of gas has meant the replacement of at least 65,000 tons of coal per annum Mr. Mackay says that this has "been the means of daily clearing from the atmosphere of Stoke-on-Trent not less than 6 million cubic yards of smoke, the equivalent of a six-inch smoke blanket over an area of 12 square miles.

Town gas, he added, has now been adapted to practically every heat requirement in pottery production and in the Stoke-on-Trent area there are factories that use no other fuel.

"We have now," said Mr. Mackay, "56 continuous tunnel kilns and 6 intermittent kilns in operation, representing an annual gas consumption approaching 1,500 million cubic feet."

COAL INDUSTRY

Some three years ago the Coal Utilisation Council published a booklet on "Smoke Abatement with Solid Fuel," explaining how smoke could be reduced by the use of modern appliances, careful firing and the choice of suitable solid fuels.

The Council has now published a second booklet, entitled "Smoke Abatement with Coal Fires," in which further particulars are given of the results already obtained from the research which is being financed by the coal industry with a view to discovering methods of burning ordinary coal smokelessly in the domestic grate.

It is admitted that old-fashioned grates such as were seen in Victorian houses smoked heavily when first lit, and blazed away too fiercely when the fire was well under way. Grates of this type were examined by Professor Cohen, who found that $6\frac{1}{2}$ per cent. of the weight of the coal escaped into the atmosphere in the form of soot.

It is pointed out, however, that the Fuel Research Station, using methods more accurate and reliable than those which were available to Professor Cohen, has recently measured smoke produced from a modern stool grate. This investigation showed that the smoke production varied between 2.50 and 1.0 per cent. of the weight of the coal, the latter figure being less than a sixth of that arrived at by Professor Cohen.

There are, moreover, grates now available on the market which embody methods of draught control



The "Camalite" Gas Firelighter

which will further reduce smoke production. The Fuel Research Station has found that under certain conditions of draught control it is possible to reduce the percentage by weight of the fuel given off as smoke to figures varying from 1.21 down to 0.72.

All these results were obtained from fires lit in the ordinary way by means of wood and paper; but by the use of gas-jets, the principles of down-draught ignition, which has done so much to eliminate smoke from large industrial plants, can now be applied to the domestic fire. The down-draught jets heat the vapours given off from the coal and produce a bright flame from the very moment the fire is started. With these jets in operation the smoke during the ignition period is almost entirely eliminated and the total smoke, including that evolved when the fire is refuelled, is one-tenth or less of the amount found by Professor Cohen in his old-fashioned grates. Since these gas-ignition jets (known as the Camalite Smoke-reducing Firelighter) will soon be obtainable through the majority of ironmongers and, it is hoped, gas show-rooms, for use with any type of fire, it can be said that means are now available for lighting a coal fire which produces flames but little smoke.

The booklet concludes with the statement that research with the object of securing still further reduction in smoke and still greater convenience in tending the fire is continuing.

Regional Committee News

—continued from page 13

9,749 chimneys were observed, with an average of 1.92 minutes smoke emission per observation. 124 notices and 580 intimations were served and 891 advisory visits made. Nevertheless in only four cases was it necessary to institute proceedings.

The Report of the Chief Inspector, Mr. James Law, which is included, makes, as usual, interesting and instructive reading. One extract may be quoted in full:—

“Colliery boiler chimneys still continue to cause nuisance, and though the fluctuating load has a bearing on this difficulty, grades of fuel in use appear to be one of the principal factors to the cause. These fuels are mostly heavy in their ash content, and are hand-fired to Lancashire boilers with fixed grates. Many methods of applying additional air are installed, but few attempts have been made to prevent the accumulation of clinker and ash on the firebars. In some cases it is essential to clean the fires about every two hours on this account. It has been stated previously that the substitution of water-tube boilers with chain grates will eventually have to be considered, and that opinion becomes more pronounced with the increased use of “dry fines.” The alternative to that would be to install methods of mechanically self-cleaning the bars. This was carried out at a large colliery in the area over two years ago and has worked very successfully since.”

References are made to the nuisances caused by coke-ovens, burning tips and spoilbanks, and refuse burning. With regard to the last an appeal is made for trade refuse not to be burned, but for the Cleansing Department to be allowed to collect and dispose of it—a welcome advance on the retrograde “Burn your refuse and save the rates” slogan still to be seen in many districts.

The Midlands

Dr. Martine (Birmingham) Hon. Secretary, reports a quarterly meeting of the Executive Committee of the Council on the 29th December, 1938, when the proceedings of the Annual Conference of the National Society were discussed. It was resolved to circularise all members of Parliament in the area with a view to enlisting their support to the resolution of the Society with regard to burning spoil-banks. There has been a satisfactory response to this appeal.

Two further Local Authorities represented on the

Council have sought approval of Byelaws respecting the emission of black smoke.

On December 8th, 1938, Dr. Martine attended a luncheon of the Rotary Club, Willenhall, Staffordshire, and addressed the members on the “Evil Effects of Smoke.” A lively and interested discussion followed. On January 10th, 1939, Mr. G. W. Farquharson (Senior Smoke Inspector, Birmingham) read a paper on Industrial Dust, Fumes and Smoke, at a well attended meeting in the Chamber of Commerce of members of the Association of Engineering and Shipbuilding Draughtsmen (Midland Branch). The subsequent discussion developed on technical lines and covered many points of interest.

A half-yearly meeting of the Council was held on 27th February, and will be reported in the next issue.

Bristol & District

The establishment of a Regional Advisory Council for Bristol and District is now an accomplished fact. Local Authorities within 25 miles of the City are represented on the Council, and they comprise of—2 County Councils, 2 County Boroughs, 1 Borough Council, 1 Municipal Corporation, 9 Urban District Councils and 6 Rural District Councils. It is anticipated that further delegates will be appointed to represent other Councils later.

An Executive Committee has been appointed and this Committee has formulated articles of constitution.

A scheme for the establishment of classes for stokers and firemen has been investigated and it is expected to commence such classes in September next. The Council consider that the matter of steam raising has an important bearing upon smoke nuisances. The prevention of nuisance is to some extent dependent upon the efficient operation of a properly constructed plant of adequate capacity. Stoking should be re-regarded as a skilled job and stokers should be encouraged to attend classes to become efficient.

The Council are anxious to secure the co-operation of industry in the matter of smoke abatement. This co-operation of industry is of considerable importance for industrialists are anxious to abate smoke nuisance by any means which are reasonable and practicable. The duty of enforcing the law rests with Local Authorities but better results can be obtained by industrial co-operation. With this in view an invitation has been extended to the Federation of British Industries to appoint a delegate to the Executive Committee and it is expected that a representative will be appointed shortly.

“THE MEDICAL OFFICER” AND SMOKE ABATEMENT

We reprint, by permission, the whole of the editorial article of “The Medical Officer” for 24th December last, and are glad to have such a warm and outspoken expression of support

THE ninth annual report (1938-39) of the National Smoke Abatement Society states that in the year reviewed reports from the stations show a diminution of 10 per cent. or more solids in the atmosphere in 43 per cent. of stations, an increase in 17 per cent. and no change in 40 per cent. This is not a rapid ascent into a cleaner atmosphere and we cannot see much likelihood of its acceleration unless the public apathy towards breathing smoke is shaken by some dramatic incident. The Croydon typhoid epidemic roused the popular determination to have a pure water supply. The epidemic was really a minor event and water supplies of the country are generally pure. It is because our waters have been brought to such a trustworthy state that the Croydon event stood out so dramatically. If there could ever be a time when people drank water as foul as the air they breathe habitually, epidemics of water-borne disease would be permanent and universal and nobody would bother about a few tens of thousands of citizens dying annually from typhoid, or cholera. So, to-day, little attention is paid to the tens of thousands of deaths annually, and the millions who suffer perennially, from respiratory diseases due largely to breathing smoke-laden air. Of course, smoke is not the only cause of respiratory disease, it is not the chief cause; but when we see, as we do, that the respiratory death-rates beat with smoke pollution in their local variations, we must conclude that smoke is a potent cause of respiratory disease and that foul air causes much more death than foul water.

We admit that the National Smoke Abatement Society is doing all it can, but the vested interests against it are so powerful that in face of an apathetic public it cannot do a tithe of what it would do. Vested interests will not yield to arguments, they feed on profits and will only use sense if their profits are threatened. The smoke producers are not averse to a clean atmosphere, they are quite ready to reduce or abolish their smoke if they can do it profitably, and are quite willing to subscribe both in money and other ways to the endeavours of those working for smoke abolition. But this gets us little further and smoke will remain with us until the determination of the people to have clean air to breathe is more powerful

than the determination of shareholders to line their own pockets. The citizens are as bad offenders as the manufacturers, for each in his own homestead does his little (and worst) to perpetrate air foulness. He prefers his coal-fire to his health, and with characteristic lack of logic praises his own grate for keeping him warm and anathematizes the chimney next door for giving him bronchitis.

It is by no means easy to get a passably pure atmosphere for its foulness is almost equal in numbers to the population, but there are ways of producing improvement which are feasible without serious dislocation of business. We might have started some progress sixty years ago if Sub-section 7 of Section 91 of the Public Health Act 1875 had been framed more succinctly. The Public Health (Smoke Abatement) Act of 1926 removed some of the nebulosities and omissions of P.H.A. 1875, but fifty years of evasion had sharpened the wits of those who could see a way even through their own smoke, so, it did not do what it might have done if it had been passed half a century earlier. This Act, together with the appropriate sections of P.H.A. 1875, is now replaced by Sections 101-106 of P.H.A. 1936, which are one of the best bits of consolidation in that deservedly much-criticised Act. But though, as in the older enactments, the law seems clear and serviceable, its application is replete with difficulties and in any case we have no powers to deal with private chimneys. A grate, or chimney, of a private dwelling house cannot be, or commit, a nuisance amenable to the public health laws. The time will come when the words “not being the chimney of a private house” will be withdrawn from Section 101 (b) of P.H.A. 1936. We wish it had never found its way in! Is a house divided into flats a private dwelling house? We believe that if we had some power to control the emission of smoke from private dwellings we should be in a better position to attack the major problems of smoke pollution. We do not ask for anything drastic, only for nuisance from smoke to fall in line with other nuisances which are recognised as being noxious in themselves independently of how or by whom they are caused. If “black smoke” is a nuisance, *sui generis*, it surely should be a nuisance whencesoever it comes and whoever produces it.

The first of a series of articles for the general reader on the principal aspects of the Smoke Problem

AN OUTLINE OF SMOKE ABATEMENT

I. *What Smoke Is—And Why*

IF paper is regarded as a fuel, is it a smokeless fuel? Usually it is, and a piece of paper to which a light is applied will burst into flame and burn practically smokelessly. But we are all familiar with the way in which, if paper is placed on a hot surface or a dull fire and is not properly ignited, it will not inflame, but will only *smoulder* with the emission of continuous smoke, and may continue to do so until it is completely charred. It may, though, suddenly burst into flames, with the disappearance of the smoke.

Burning, or combustion, is a chemical action between the oxygen of the air and substances, chiefly carbon, in the fuel, an action which takes place with the liberation of a great deal of energy in the form of heat. The action with ordinary fuels does not take place at normal air temperature but only at some higher temperature called the ignition temperature. Heat must therefore be first applied to the fuel to set it burning, after which the heat that itself generates is sufficient, as a rule, to start the combustion further on, so that the burning continues progressively until the whole has been consumed.

Some portions of the substance of a piece of paper or other fuel are driven off, when heat is applied, in the form of gases or vapours, while other portions remain in the solid form. The latter, chiefly carbon, burns with a red glow, like charcoal (which is roughly the same) and is known as “fixed carbon.” The volatile portions become vapours before they burn, but under the right conditions burn fiercely as soon as they meet the oxygen in the surrounding air. This action is visible and is seen as *flame*.

If the conditions are not right and the escaping volatiles either fail to find oxygen, or find it only when they are below their own ignition temperature, they do not burn, and so escape into the outer air. Here they may in part disperse as vapours or gases, or cool down and condense as soot and perhaps tarry or oily matter.

Smouldering is thus due to either insufficient heat or insufficient air, and results in the emission of all or some of the volatile matter in the form of smoke and soot. How this occurs is made familiar by the smoking of an oil lamp if the air supply is reduced too much (or what is the same thing, if the wick is too

high and the oil needs more oxygen than there is available for it), and by the effect of putting a candle flame against a cold surface, when the sudden cooling effect and lack of air cause a deposition of soot.

It will be apparent that a fuel which may emit smoke in some circumstances will in others, when the conditions are correct, burn smokelessly. The bituminous coal which causes our smoke problem can, if it is dealt with properly, burn with virtually no smoke. Fuels with little or no volatile matter, like charcoal or coke, cannot of course emit smoke in any circumstances, although as with coal the carbon itself will not burn completely if the air supply is unduly restricted.

For a substance like paper it is easy to obtain the correct conditions for smokeless combustion, but with coal it is a different story. Coal is not a simple substance but a complicated and variable mixture of intricate compounds of carbon and hydrogen, which when heat is applied begin to break up, change, and even to react among themselves. Coal varies widely in its composition, especially in the proportions of volatile matter and fixed carbon, and even a single lump will visibly exhibit portions of different characteristics. The volatiles are composed chiefly of compounds of hydrogen and carbon (hydrocarbons) which are easily driven off but difficult to burn. If the heat causes them to react among themselves instead of with the oxygen of the air, other bodies even more difficult to burn may be formed.

Thus the smoke problem as we know it is due to these difficult hydrocarbons, and it is clear that to prevent smoke when coal is burned there are three possibilities:

1. To use coal that contains little or no volatile matter.
2. To remove it before burning the coal.
3. To burn coal containing it only under the conditions required for its complete combustion.

These conditions will be more fully discussed in a further article, but it will be useful to indicate the different types of coal and coal derivatives, showing how the ratio of fixed carbon and volatile matter varies.

			Percentage	
			Volatile Matter	Fixed Carbon
Oven coke	...	...	0.5	86
Gas coke	...	...	1 to 5	85
Anthracite	...	...	Below 8	93 or over
Low Temperature semi-coke	...	...	6 to 12	70 to 83
Steam coals, anthracitic...			8 to 12	80 to 90
Steam coals, higher volatile range	...	...	12 to 16	75 to 80
Bituminous coal	...	...	20 to 43	43 to 75

What Smoke Is

The smoke that passes up our chimneys consists of finely-divided sooty particles, with which is associated tarry, acidic, and gritty matter. At first the particles are extremely small, but the longer the time before the smoke escapes into the outer air the more will the particles coagulate into larger "smuts." When once the smoke is in the air the chances of coagulation become very small, so that the atmosphere becomes charged with myriads of fine and even sub-microscopic particles. It is these particles, and not the smuts, that cause the most serious effects of smoke. With them are to be detected minute fragments of coal, coke, slaglike and glassy material, some often in the form of fused spheres.

The composition of the smoke, as determined by analyses of the soot, varies widely according to the nature of the coal and the conditions under which it is burned. Domestic soot is very different from that formed in industrial plant that is working at higher temperatures and with stronger draught. Domestic soot contains roughly 35 to 50 per cent. of carbon, 12 to 40 per cent. of tar, and 5 to 20 per cent. of ash. Soot from the top of a boiler chimney contained 27 per cent. of carbon and 61 per cent. of ash. There are also in both cases small amounts of ammonium chloride and sulphate and acidic matter.

How Much Smoke?

Cohen and Ruston estimated the soot produced by domestic fires as equivalent to not less than 6 per cent. of the carbon in the coal burned, which on an annual domestic consumption of 36 million tons would be equivalent to over 2 million tons of carbon per annum. If domestic soot contains an average of 60 per cent. of carbon (in the pure state and as tar) the total weight of soot and smoke would be about 3.3 million tons annually. (See Bone and Himus, "Coal: Its Constitution and Uses," 1936).

The weight of carbon lost in factory smoke is estimated by Bone and Himus at 1.25 million tons,

which as factory smoke contains about 25 per cent. of carbon, means a total annual production of about 6 million tons of soot and smoke.

On this basis it would appear that there is twice as much total emission from industrial as from domestic sources, but that the domestic chimney is responsible for nearly two-thirds of the most obnoxious constituents, soot, and in particular, tar. The ash from the factory smoke is certainly objectionable, but it is not adhesive and is readily washed away by rain. The particles from the shorter domestic chimneys probably will not coagulate to the degree attained by industrial smoke, and being finer, will remain suspended in the air for considerably longer periods. As already mentioned, it is these finer particles that are most injurious, and to quote Professor R. Whytlaw-Gray, "they penetrate the respiratory passages and deposit in the lungs, they promote fog by acting as condensation nuclei for moisture, they scatter and absorb sunlight, and they adhere firmly to any surface they encounter."

These points are mentioned as indicating the more serious consequences of domestic smoke, although in no way do they lessen the need for the abatement of industrial smoke.

A recent publication, "Smoke Abatement with Coal Fires," states that a modern stool grate tested at the Fuel Research Station showed a smoke production of between 2.50 and 1.0 per cent., the latter figure being less than one-sixth of that determined by Cohen and Ruston. It is not clear if "soot" (i.e., carbon) or total smoke is referred to, but as the figure is compared with Cohen and Ruston's soot figure, it is presumably the former. Because of the—welcome—improvements in the design of open grates, doubt is cast upon the figures, "forty years out of date," arrived at by Cohen and Ruston.

It may, however, be pointed out that in the first place these are *minimum* figures only, and that Cohen and Ruston specifically stated that in their tests no slack was used, which is never the case under normal conditions, apart from the common practice of "banking up" with smalls and slack. The use of slacks results in excessive smoke emission and this applies to modern grates as well as to the older type. Both the new and old figures refer to ideal rather than actual conditions. Secondly, a large proportion of the grates in use are of the same or similar type to that on which the tests were made. Considering all factors, it is probable that domestic chimneys to-day contribute something in the order of 2 million tons of soot, or 3 million tons of smoke, to the atmosphere each year.

News and Reviews

Electric Vehicles : Promising Developments.

An article in *The Financial Times* of 6th February on developments in the use of electric vehicles for urban areas has a special interest from the atmospheric pollution point of view. Although not usually a direct menace to health the street pollution from exhaust gases in congested urban areas is at the lowest unpleasant, and the promotion of electric traction is to be welcomed. Electric vehicles have been in use for many years, but have not found wide favour, largely because of costs and difficulties in connection with the battery and charging plant.

New developments will make it possible for the user of a battery vehicle to overcome these drawbacks by renting both battery and charger—as one now rents an electric cooker. The battery is regarded as “fuel” to be paid for through the meter. Standardisation of batteries and local depots for their servicing and exchange will maintain efficient operation and reduce costs. As batteries are charged only at night this forms an ideal off-peak load for the electrical supply industry.

The electric vehicle has many advantages other than that of creating no pollution, and is the cheapest form of mechanical road transport. Its use is of course restricted, but the modern vehicle has a range of up to 50 miles. It is estimated that 295,000 commercial vehicles—60 per cent. of the total number—operate only in urban areas and average not more than 30 miles a day.



“Rexco”

A trial on ordinary open fires and in a domestic boiler has been given to the low temperature carbonisation fuel marketed under the name of “Rexco” by the National Carbonising Company, Ltd. The fuel was found to be very satisfactory in all respects. Ignition was rapid and the fire burned up quickly, with some flame and a pleasant appearance, and gave a remarkably good heat radiation into the room. The lasting power was good and the fuel continued to burn brightly with very little unconsumed residue at the end. On the domestic boiler good results were also obtained, the free-burning quality not being too high to hinder adequate control for keeping the fire in during the night. Here too, the radiation efficiency was shown by the rapidity with which the water could be heated.

In appearance “Rexco” is more like coal than coke, and is in the form of the original large pieces of coal from which it is produced. It is carbonised in a new type of large, internally-heated retort, using a non-caking coal, in a plant at the Mansfield Colliery Company. Further particulars can be obtained from the manufacturers, the National Carbonising Company, Ltd.

* * *

Leeds v. Sheffield

Mr. James Law, of Sheffield, caused what was described as “a minor disturbance” at a meeting in Leeds when he said: “Please don’t think Sheffield is smokeless. It is just as dirty as Leeds.” Mr. C. S. Shapley, engineer and general manager of Leeds Gas Department, said in reply that he had lived in both places and could say that Sheffield was dirtier than Leeds. “I know by the size of my washing bill,” he added.

* * *

Smokeless Hillington

This aerial view of the Scottish Industrial Estate at Hillington, Glasgow, reveals its absence of chimneys. No factories are allowed to generate their own steam, but are supplied from a central boiler-house by means of underground ducts. The boiler-house incorporates smoke-prevention plant and has a chimney about one-quarter the height of the usual factory stack. Process steam is charged at a flat rate of 2s. 3d. per 1,000 lbs. Steam for heating purposes is distributed in the factories by units suspended from the roof trusses. Lawns and flower borders front the estate.

68 flats with complete
labour-saving smokeless
fuel service & automatic
hot-water supply to bath-
room, sink and copper.
Rents—three bedrooms,
11/6 a week.



No smoke comes from KENSAL HOUSE

—Gas *can* make London clean

The chimneys of Kensal House add not one particle of soot to the 75,000 tons that fall on London yearly—(costing its citizens £4,000,000 a year).

The tenants of Kensal House enjoy a complete, labour-saving, smokeless fuel service—including an automatic hot water supply. This service will cost them less than the working class Londoner usually

pays for fuel for cooking and heating alone.

There is no excuse for allowing the chimneys of new housing estates to poison the air and blacken Londoners' lungs. Gas under the Two-part Tariff offered by the Gas Light and Coke Company to all subsidised estates in its area, can better conditions and lower the cost of living. Gas and Coke can make London clean.

THE GAS LIGHT & COKE COMPANY—never lets London down

Free expert technical advice and assistance

★ ON ANY FUEL, EFFICIENCY OR INSTALLATION PROBLEM



SMOKE
ABATEMENT

SMOKELESS
OPEN FIRES

CENTRAL
WARMING

HOT WATER
SUPPLY

AIR CONDITIONING

STEAM RAISING

CINEMA and
THEATRE WARMING

THERMOSTATIC
CONTROLS

GRASS DRYING

SOIL WARMING

GLASSHOUSE
HEATING

ORCHARD HEATING

If you are installing heating plant of any description ; if you have a fuel or heating problem ; if you are not satisfied that you are getting the best out of your existing plant or furnace, write or telephone to the London & Counties Coke Association. Our Technical Department will make a thorough investigation of your special needs, freely and without obligation.

The London & Counties Coke Association gives technical assistance to all users of fuel, to Architects and to Heating Engineers ; its Engineers and Fuel Experts attend personally to advise impartially on installations of plant, to carry out boiler tests and to assist in securing the greatest efficiency.

Authoritative Brochures dealing with the subjects alongside have been issued by the Association ; these illustrate and describe in full the different types of plant which have been tested and approved by the Association. Copies will be sent free on request.

THE LONDON AND COUNTIES COKE ASSOCIATION

1, Grosvenor Place, London, S.W.1. (SLOane 5136)



Electricity for happier living

Electricity, the pure, flameless, fumeless, smokeless source of light and heat has won the fight against squalor, dirt and smoke.

All over the country re-housing schemes are depending on electricity to ensure a cheap, practical, simple means of securing lighting, heating, cooking and abundant supplies of hot water.

In the commercial and industrial fields the continued increase in the use of Electricity is contributing in no small measure to the lessening of atmospheric pollution.

Announcement of

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.

2 Savoy Hill, London, W.C.2

Temple Bar 9434

*Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.*
—Wordsworth.

SUMMER
1939

SMOKELESS AIR

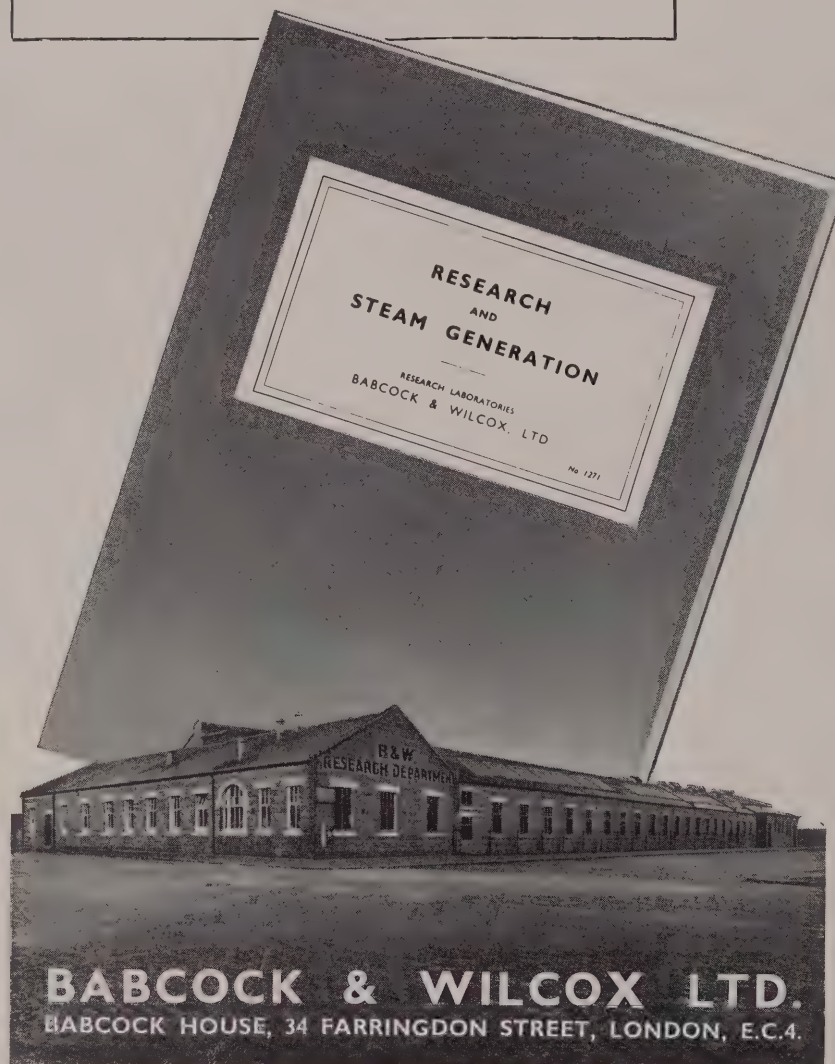
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A NEW PUBLICATION



ATMOSPHERIC POLLUTION IN 1937-38

The New Report

THE 24th Report on the Investigation of Atmospheric Pollution is published (by H.M. Stationery Office) in a new form. The general deposit tables of the individual stations, which take up a considerable amount of space and are of restricted interest, are now issued as a supplementary volume (at 4s. 6d.), which has enabled the more important report and tables to be sold at the reasonable price of 2s. The page size has been reduced to a more convenient medium octavo. As a wider distribution and study of the report must encourage the smoke abatement movement generally it is hoped that these changes will materially encourage sales.

An interesting and useful feature of the report is an article on Fog by Dr. J. S. Owens, which should be of value in helping to remove many of the erroneous conceptions on the nature of fog and the part played by smoke. Dr. Owens points out that if its escape is sufficiently impeded the smoke produced in London in two or three hours on a winter morning is enough to make a dense smoke fog.

An innovation during the year under review was a conference of analysts and others engaged in making the measurements for the local co-operating bodies, and it is stated that the discussions which took place were of great value.

The Leicester Survey

The report records the continuation of the intensive survey at Leicester, which was to be continued until March, 1939, after which it is said that it will be possible for a beginning to be made of the examination and analysis of the observations taken. It is unfortunate, even if unavoidable, that there should be such a time-lag in the preparation and printing of the annual report, and presumably we shall have to wait for the 1939-40 report, which may be expected in two years' time, for some of the conclusions that may be drawn from this important survey.

The staff conducting the work at Leicester have had

the opportunity of studying and testing in practice new or improved instruments and methods for measuring pollution. Such instruments include that for obtaining hourly values of sulphur pollution by the volumetric method, the directional lead peroxide gauge, and the new instrument for the measurement of ultra-violet daylight.

A further interesting development is an apparatus for the simultaneous measurement of sulphur and black suspended impurity, upon which work has been done at Glasgow, Hull, and Sheffield. The Committee expect shortly to be able to agree to the terms of a specification for apparatus of this type. Those co-operating bodies which already measure sulphur pollution by the volumetric method will then also be able to obtain, very simply, information about the amount of suspended impurity in the atmosphere.

The Year's Figures

The state of pollution during the year under review in comparison with previous years is best summed up by the tabulation given in Table I, which shows the numbers of stations recording a reduction, an increase, or "no change" over its own "general average." This tabulation is based on a group of 33 stations for which the "general average" is available for the five years ended March, 1932. "No change" is recorded when the change is within 10 per cent. of the general average for that particular station.

All categories except "carbonaceous other than tar" show more reductions than increases, and for total solids the ratio is 6 : 1. It should, however, be borne in mind that the deposits may to some extent have been modified by the fact that rainfall during the year was below the average, and this in particular may account for the marked reduction in soluble matter.

It is difficult to draw any precise conclusions from these figures, but it is clear that since "reductions" are substantially more than "increases," the extent of pollution is moving downwards. This has been the

"I was particularly gratified to notice the public interest which was taken in the recent Smoke Abatement Exhibition arranged by the National Society at Charing Cross Station, and I should like to congratulate the Society on the elegance and attractiveness of the new decor and production in which *Smokeless Air* has reappeared this month."

—*The Rt. Hon. Walter Elliot, M.P.,
Minister of Health, addressing the
Greater London Advisory Council
for Smoke Abatement.*

case in the two previous years, as shown in the more detailed table given in the report.

The Individual Figures

Table II gives the mean monthly deposit (total solids) for the individual stations in English tons per square mile. The second figure opposite some of the stations, in black, is the mean monthly deposit expressed as a percentage of the general average for that station. Thus 144 opposite Birmingham, Great Charles Street, means that the mean monthly deposit of 42 tons per square mile is 144 per cent. of the general average, i.e., there is an increase of 44 per cent. If the figure is over 100 there has been an increase; if below, a decrease. The deposit figures are given to two decimal places in the report tables, but here, for simplicity, they are given to the nearest whole number only. This figure multiplied by 12 gives the total deposit for the year.

The Automatic Filter

The automatic filter records, hour by hour, the amount of solid matter suspended in the atmosphere.

	Per cent. of Stations showing :		
	Reduction	Increase	No change
Insoluble Matter :—			
Tar	57	30	13
Carbonaceous other than Tar	39	42	19
Ash	52	22	26
Soluble Matter :—			
Loss on Ignition	58	6	36
Ash	78	3	19
Total Solids	55	9	36
Included in Soluble Matter :—			
Sulphates	67	13	20
Chlorine	38	31	31
Ammonia	79	14	7

Table I (*see text*).

Sixteen filters are in operation in seven towns only, so that general comparisons are not possible. Cardiff once more shows the least average concentration of sooty matter, and is the only station which did not throughout the year register the concentration that is taken to signify a day with smoke haze, or "Z" day.

(Concluded at foot of next page)

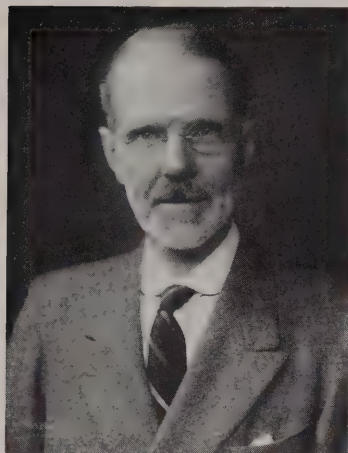
Birmingham, Gt. Charles St. ... 42	144	Huddersfield, Cooper Bridge ... 9	31	Marple 7	53
West Heath ... 13	119	Deighton ... 23	69	Marsden 16	
Bournville, Village ... 10	108	Keighley 11		Newcastle-upon-Tyne, Town Moor 18	85
Works ... 11	96	Kingston-upon-Hull, Central ... 34	115	Westgate Cemetery ... 20	62
Bradford, Central ... 21	66	Country ... 10		Otley 12	
North ... 15	124	Suburban ... 10		Pontefract 50	
Bristol, Waterworks ... 24		Leeds, Headingley ... 10	96	Rochdale, Town Hall ... 14	59
Zoological Gardens ... 10		Hunslet 24	88	Rothamsted 7	68
Burnley, Bank Hall Hospital ... 19	87	Park Square 28	101	Rotherham, Oakwood Hall San. 15	124
Marsden Rd. San. ... 15		Templenewsam ... 12	140	Technical College ... 24	93
Swindon Reservoir ... 9		York Road 26	97	St. Helens 23	61
Town Hall ... 27		Leicester, Humberstone ... 10	80	Salford, Drinkwater Park ... 21	130
Cardiff 11	76	Town Hall 22	78	Ladywell Sanatorium ... 22	88
Castleford 27	91	Liverpool, Aigburth Vale ... 13		Peel Park 17	53
Coventry, Edgwick ... 16		Cambridge St. ... 30	117	Sheffield, Attercliffe ... 32	125
Greyfriars Green ... 19		St. George's Hall ... 28		Dore 9	
Whitley 13		Loggerheads 4		Ewden Waterworks ... 8	
Dagenham 13		London, Archbishop's Park ... 23	91	Nether Green 11	125
Dewsbury, Gas Works ... 17		Battersea Park 22		Stocksbridge 22	117
Municipal Buildings ... 19		Finsbury Park 17	78	Surrey St. 28	84
Whitley 15	152	Golden Lane 25	71	Shipley (Yorks.) 18	101
Edinburgh, Glencorse ... 6		Horseferry Rd. ... 39	133	Skipton 13	
Leith Links ... 14	94	Kew Observatory 'N' ... 10	103	Southampton 14	101
St. Andrew Square ... 21		Kew Observatory 'S' ... 12	106	Southport, Bedford Rd. Pk. ... 12	112
Garston (Herts.) ... 12	93	Mount St. 32	131	Hesketh Pk. 6	54
Glasgow, Glasgow Cross ... 30		Ravenscourt Pk. ... 17	61	Stirling 15	
Queen's Park ... 17	100	S. Kensington (M.O.) ... 20	97	Stoke-on-Trent, Leek Rd. ... 19	102
Ruchill Park ... 17	84	Southwark Pk. ... 21	88	Longton 25	101
Tollcross Park ... 23	90	Victoria Pk. 17	98	Tunstall 19	
Victoria Park ... 18	68	Wandsworth Common ... 16	101	Wakefield, Clarence Pk. ... 10	83
Gloucester 10	69	Loughborough, No. 1 Gauge ... 12	48	Park Lodge Lane ... 21	
Godalming 7		No. 2 Gauge ... 11		W.R. Rivers Board ... 32	135
Greenhithe 47		Manchester, Baguley 9		Wallsend 13	85
Halifax, Akroyd Park ... 16	124	Booth Hall 15		Wallsall 10	
Belle Vue Park ... 15	119	Heaton Park 12		Widnes, Isolation Hospital ... 22	
Infirmary ... 13	115	Oldham Road ... 39		Moor Lane 42	
Wade Street ... 27	112	Philips Park 40		Wolverhampton 10	
West View Park ... 11	101	Rusholme 25			
Hove 31		Withington 13			

Table II. Mean Monthly Deposits (tons/square mile) with Percentage of General Average (*see text*).

Who's Who in Smoke Abatement

I. Dr. Des Voeux

(The first of a series about people of note in the movement for cleaner air).



IF a search is made through old records for the reasons for the remarkable advance in the idea of smokeless air during the past forty years, we find that it has taken place during the period that Dr. H. A. Des Voeux has been working for the movement, and come to the con-

clusion that to a large degree the progress is due to him as an individual.

He took a leading part in the formation of the Coal Smoke Abatement Society in London in 1898, for which he was Hon. Treasurer until 1929. In addition to the task of securing an income for the Society, he played a leading part in most, if not all, its projects—such as the lengthy tests on domestic grates and gas stoves. The committee at one time met fortnightly at his home in Buckingham Gate, where the reports of

the two smoke inspectors employed by the Society were received. Such, in those days, was the opposition and the ill-repute of this small society of faddists, that no inspector's report was forwarded to the local sanitary authorities unless there was a minimum of 10 minutes *black* smoke in an hour.

With Dr. J. S. Owens he was responsible for the first sootfall observations in London (in 1910) and it was their demand for a fuller investigation that led ultimately to the systematic observations that to-day cover such a wide field and are carried out under the auspices of the Department of Scientific and Industrial Research.

In the years following the war the Society, led by Dr. Des Voeux, played an important part in pressing for new legislation, and this work only ceased when the Act of 1926 was passed. At a conference in 1929 the Society joined forces with the Smoke Abatement League of Great Britain, to form the present National Society, and there was no hesitation in electing Dr. Des Voeux to the position of President.

At subsequent conferences his presidential addresses are always inimitable and delightful, and his replies to Mayoral welcomes have a charm that is all the more appreciated when, on occasion, they contain a courteous but none the less potent expression of opinion of the smokiness or dirtiness of the city concerned.

Some years ago Dr. Des Voeux released himself from his London practice and "retired" to his home at Lymington, in the New Forest. Inverted commas are used because by all accounts he continues to be as busy as ever in administration work in the district as well as remaining "Smoke Abater No. 1."

In contrast with this, however, for the winter months 65 per cent. of the days were "Z" days at Greenwich, 59 per cent. at Stoke-on-Trent, and 54 per cent. at Victoria Street, London.

Taking the percentage of "Z" days for each day of the week for all stations, and averaging the years 1933-38, it is found that Sunday is the least hazy—for obvious reasons—and that Monday, Tuesday, and Wednesday are more hazy than the later weekdays, Tuesday being the haziest day of all. This is an intriguing fact, the reason for which, as the report confesses, "is not obvious."

The suspended impurity is in all cases higher in winter than in summer, and the ratio between the two periods is greater for commercial and residential districts than for industrial districts. This is what would be expected as a result of the increase in the

emission of domestic smoke during the winter.

Observations in U.S.A.

A section of the report records survey observations with the deposit gauge in and around New York. For the period of this survey (it is not clear if it is being continued) no less than 100 gauges were in operation: 35 in the Borough of Manhattan alone. The results are extraordinarily high, and although some of the suburban and residential figures appear to be comparable with those in similar districts in this country, the industrial and "slum" areas are far in excess of what is experienced here. From Table II, previously discussed, it will be seen that the highest deposit recorded is 50 tons per square mile per month. One industrial section in New York gives 141 tons, a slum station 217 tons, and a harbour locality 173 tons.

CIVIC CONSCIOUSNESS

AN OBJECTIVE FOR SMOKE-ABATERS

Mr. C. Gustave Agate, F.R.I.B.A., was the speaker at a recent luncheon of the North-Western Branch of the National Smoke Abatement Society. Representatives of other interested Manchester bodies were present since Mr. Agate's theme dealt with smoke abatement from the point of view of co-ordination.

Although he was supposed to begin with "the usual lurid invective" against smoke, Mr. Agate said he rather hesitated to sing his amateur Hymn of Hate before experts whose training in voice production had been so much more intensive than his own.

Diagnosis Required

"Co-ordination," said Mr. Agate, "is one of those comfortable words which at first sight would appear to be a panacea for all ills. Is it then proposed to apply it light-heartedly to ourselves as a sort of homeopathic treatment and is not some diagnosis first required of the constitutional debility from which we think we are suffering?" He was sure that "what often contributes to our failures is the habit of looking at our problems in compartments and sections" and was very doubtful of the value of specialisation. "It is all very well to say that the preservation of the countryside has nothing to do with milk for mothers nor municipal concerts with either, that smoke abatement fans are not necessarily interested in playing fields or repertory theatres. They should be, at any rate to the extent of being conscious that they belong to the central trunk of the tree that carries sap to the various branches of culture, amelioration and betterment." That sap in Mr. Agate's view, was "what we call civic consciousness and is what vitalises, or should vitalise, all the activities of a community."

A Centre of Civic Interest

At present our activities straggled all over the place in various stages of growth, all wondering what was the matter with them and why they did not grow quicker and stronger, never realising that it was nourishment they were short of, or the right kind of nourishment. There should be set up "a special Centre of Civic Interest of the most comprehensive nature. It might be the work of a co-ordinating body drawn from all the interests for betterment," and in it would be gathered together on permanent exhibition

all the historical treasures they had, but a record of the past should be only half the function of the Centre, for it must serve the future also by a study of the present. He saw this organisation as a large and progressive thing, a sort of sensitised plate which would record the variations in the conditions of life and habit of our people. Without a complete pulse and temperature chart of this kind it was impossible to see our different activities in proper relationship to each other. Not only could such a centre provide accommodation in the right atmosphere, but its general use would create an identification in the public mind between these societies and their common civic purpose. Many societies and organisations were represented there. "Was there any delegate," asked Mr. Agate, "who did not feel the need of an opportunity for record and display of progress of his own activity, or who had any doubts as to the enormous collective and cumulative power of such an institution as that described, to awaken and hold the interest and imagination of the public?"

Eliminating the Watch-dog

That it would ultimately attain the status of a civic society there could be no doubt, but it would be a civic society of a new kind, founded on self-analysis and self-criticism, eliminating altogether the function of watch-dog to the Corporation, which was often an unfruitful, because antagonising, element. Its work would be educative and informative and its purpose the creation of civic pride and a common impulse; granted sufficient strength in these two reactions, all the purely ameliorative societies could shut up shop, which, of course, should be their ultimate aim.

In considering co-ordination in connection with smoke abatement alone we were wasting power which ought to be utilised for a much wider purpose, and the same thing would apply to every other *single* aspect of social work. This idea might sound utopian, but he was a believer in Utopia, concluded Mr. Agate, and "without this belief it seems to me that Smoke-Abatementers rank merely as scavengers, Town Planners as Public Works contractors, the C.P.R.E. as gamekeepers and farm bailiffs, and architects as just nothing worth talking about at all."

News from U.S.A.

Pittsburgh's Elaborate "Smog" Enquiry

MOST of us know something of President Roosevelt's N.R.A. with its intriguing variety of code sub-divisions such as C.C.C., T.V.A., and W.P.A. Project No. 15440 of the last named has been concerning itself throughout 1938 with a study and analysis of air pollution. The survey has meant an analysis of sootfall, the observation of smoking chimneys, the measurement of solar ultraviolet radiation, and perhaps most interesting of all, the circulation of a health questionnaire entitled "Smog and you," which has been answered by no less than 5,605 citizens of Pittsburgh, Pa.

In this "effort toward the control of waste, discomfort, and illness caused by 'smog'" which claims to be "the first such study ever attempted in a large city," the 5,605 have been classified according to no less than eight age groups, sex, height, weight, occupation, size of family, district, size of house and equipment used in heating it. They have been given fifteen different suggestions as to how they might feel on 'smoggy' days, including tickle in throat, raw throat, "frog" in throat, irritable, tired, "blue," or just lazy, and invited to say which one fits their case. They were then invited to investigate their general health; were colds frequent each winter, were they head colds or chest colds, what was their duration, did they attempt to treat their colds or let them run their course or consult a doctor, and in what sort of weather did they suffer colds most? Then the searchlight plays upon other ailments to which they may be subject, do they suffer from pneumonia, sinus trouble, sore throats, tonsillitis, bronchitis, asthma, tuberculosis, or other chest ailments? Are they taking cod liver oil or other vitamin preparations and if so were they prescribed by a doctor; and how long do they stay in bed and how long away from work?

Finally the vices receive notice: do they go to the movies, if they smoke what do they smoke, if they drink do they drink to excess, and do they get a vacation every year?

Having collected this information we find the W.P.A. authorities still uncertain of having the subject under control, their feeling being that "the accumula-

tion and persistence of atmosphere pollution is dependent to a considerable extent upon meteorologic factors." So for each day of every month of 1938 they have kept a chart showing pneumonia morbidity and mortality, the wind velocity and direction, the temperature, relative humidity, the precipitation, and percentage of sunshine and degree of fog. Their enquiry is still incomplete; it is therefore too early to draw conclusions.

Conference at Kalamazoo

Fuel Engineering Conferences are regularly organised by Appalachian Coals, Incorporated, of Cincinnati, Ohio, and at one held recently at Kalamazoo, Michigan, a paper entitled "Some Fundamentals of Smoke Abatement" was read by Mr. J. F. Barkley, Supervising Engineer, Fuel Economy Service Station, U.S. Bureau of Mines. Mr. Barkley dealt mainly with the abatement of industrial smoke. He drew an analogy between air pollution and the water supply. The public desires pure water, expects pure water, is willing to pay for pure water, and expects to continue to pay for pure water indefinitely; it is a development of civilisation.

People in general have not yet reached the stage of fully understanding air pollution as a detriment to their well-being. In attacking the problem an "ordinance" must be passed and much has been done on model ordinances. Although they are all concerned with smoke, none of them defines smoke, but the amount of smoke permitted is based upon its density; to establish this the Ringlemann Smoke Chart, which expresses the percentage of blackness by definite shades of grey, was devised. There have been many objections to this method but they are really inconsequential when the purpose is considered, which is to lessen smoke emission and to co-operate in making a cleaner neighbourhood.

An ordinance should make possible the issuing of regulations as to the design of fuel burning equipment, and such regulations as exist include rules as to type of stokers, setting heights, loading, heat releases, breechings, stack heights, smoke indicators, etc. Successful smoke abatement, however, finally ends in human factors. Operators must be trained in the handling of their equipment and devices should be installed so that they can always know the smoke condition of their stacks; one very effective instrument consists of the blowing of a raucous horn when the smoke density passes a chosen point.

“SOUTHERN ELECTRIC”

3041 electric vehicles running over 684 route miles of railway—1644 miles of tracks—is the measure of the important contribution to the solution of the railway smoke problem made by the Southern Railway

ACHIEVEMENTS in overcoming the special difficulties of smoke abatement in railway transport have been solved in no small measure by the Southern Railway electrification schemes in Southern England.

The history of the substitution of electric traction for steam in the London area goes back to December 1st, 1909, when the first step was taken in the great electrification movement which has now become the world's largest suburban electrified system.

On this day, electric trains made their debut on the London, Brighton & South Coast Railway between Victoria and London Bridge stations (the South London Line).



Attractive platforms in white concrete remain attractive on electric railways. An S.R. suburban station.

When the amalgamation of the railways took place in 1923, the London, Brighton & South Coast Railway, together with the London and South Western and South Eastern & Chatham Railways, became merged in one Company, known as the Southern Railway. This Company, which has pursued an intensive electrification policy, has now more miles of electrified

track than any other railway in Great Britain, and has become the pioneer in main line electrification in this country.

The Reason

The Southern suburbs are the most densely populated district around London and the Southern train service the most intensive. With comparatively short stretches of line and a large number of places to serve, traffic operation is not an easy matter, especially as the local trains have to be “dove-tailed” into the Main Line schedules. The rapid growth of new housing estates in the outer suburbs during recent years, with the consequent increase in the number of travellers, made the problem even more acute. Speedier and more frequent services were essential, and the solution of the difficulty was—electrification.

The advantages of electric traction are numerous. It is much cleaner, the stations and rolling stock do not become beds of soot and grime, and it gives a better train service, because it saves many valuable minutes in rapid acceleration and in quick “turn-rounds” at termini. Electrification also enables train times to be standardised to a large extent and this leads to a greater frequency of service.

How It Grew

Following upon the South London Line, the London, Brighton & South Coast Railway electrified its lines from Victoria and London Bridge to the Crystal Palace in 1911 and 1912, and three years later saw the opening of the first electrified line on the London & South Western Railway (except, of course, the underground Waterloo and City Railway, which has been in operation since 1898). This was from Waterloo to Putney and Wimbledon, and was followed in 1916 by the electrification of the Kingston “round-about,” Shepperton, Hounslow, Surbiton, Hampton Court and Claygate routes.

No portion of the former South Eastern & Chatham Railway was electrified prior to the amalgamation in

1923, although when the grouping came about a scheme was under consideration.

Immediately after its formation, the Southern Railway Company went straight ahead with electrification, and between 1925 and 1935 the many lines which constitute the suburban system were converted and electric traction instituted.

The original L.B. & S.C. Railway electric trains were operated on the alternating current (or "overhead") system at a voltage of 6,600, while the L. & S.W. Railway used the direct current (or "third Rail") system at a voltage of 660. As it was essential to have a standard system for all lines, the Southern Railway decided to adopt the "third rail" method, and the "overhead" sections were therefore converted as speedily as possible.

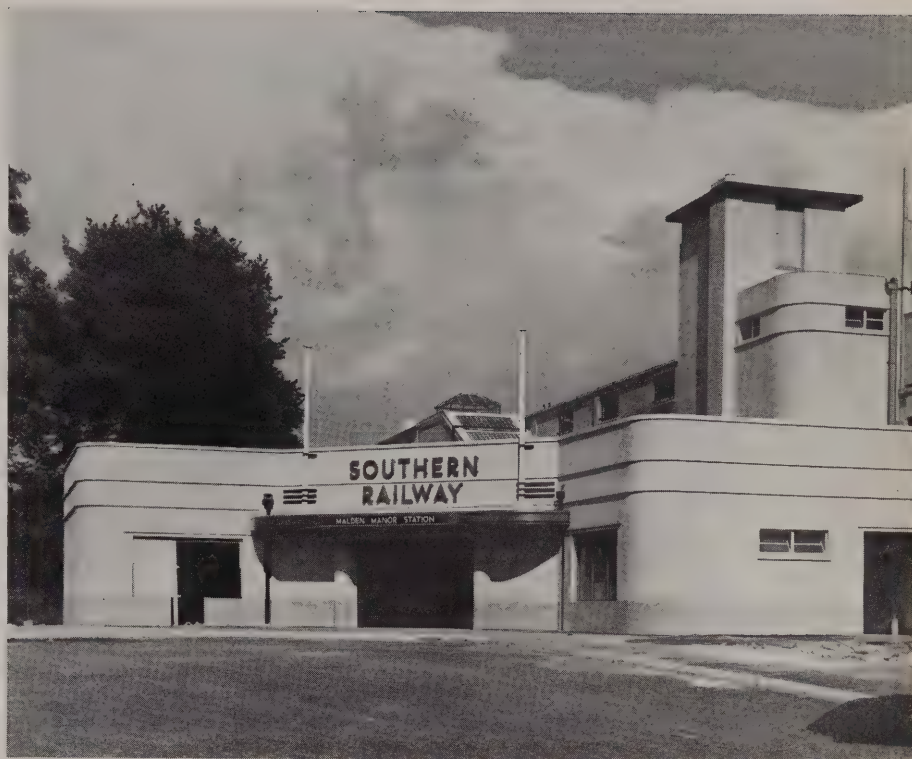
Electrifying Main Lines

It was in 1929 that the Company decided to electrify the main line to Brighton and Worthing. For some years the problem of improving the train service on this line had been under consideration. A vast amount of traffic was handled, and although the Company maintained a very fast and frequent steam train service, it was felt that electrification was necessary to meet traffic requirements.

So the work was put in hand. It was the first main line in this country to be electrified, and the cost was £2,750,000. This included the construction of entirely new rolling stock of a most luxurious type, as well as the installation of electric colour light signalling. The first section—from Coulsdon to Redhill, Reigate and Three Bridges—was opened in July, 1932, the throughout service (London to Brighton and Worthing) being operated on and from January 1st, 1933.

It was an instantaneous success. The already heavy traffic increased still further, and in December, 1933, the Southern Directors decided to proceed with the electrification of the line to Lewes, Seaford, Eastbourne and Hastings. The cost of this was £1,750,000 and, like the Brighton scheme, included the construction of new rolling stock. The work completed, electric services commenced to run on July 4th, 1935.

Having achieved such a large measure of success with these electrification schemes, however, it was not



Clean, white modern architecture is feasible for stations serving electric lines. No smoke, grit, or coal dust!

the Company's intention to allow matters to remain there. Still further projects were authorised, with the result that the main line from Surbiton to Portsmouth via Woking and Guildford was given over to electric traction in July, 1937, and coincident with this scheme was the Woking to Aldershot and Alton and the Weybridge to Staines electrification.

With the completion of this scheme, at a cost of £3,000,000, the Southern Electric stretched its tentacles into Hampshire. Then work was begun on the Mid Sussex line to Portsmouth and the west Sussex seaboard, thus linking Dorking North to West Worthing and Portsmouth, including Littlehampton and Bognor Regis, with electric traction. With the operation of this latter route, which commenced electrified running in July, 1938, the whole of the original main lines of the London, Brighton & South Coast Railway said good-bye to steam for passenger traffic.

From January 1st, 1939, the line from Staines to Reading became electrified, and during the summer of this year it is hoped to run electric trains to Gillingham, Maidstone East and West.

ATMOSPHERE, in the mental sense, is an important factor in the success of a conference, and it will be interesting to note whether the atmosphere of our meetings at Blackpool in September is any different from that of the previous conferences which have all been held beneath the smoke of our larger cities. The physical atmosphere will obviously be different, and if the discussions have twice their usual vitality it will tend to show that clean sea air is mentally exhilarating and will give an argument to those who believe we should, like other organisations, hold our meetings in enjoyable surroundings. And if the attendance figures break the record we shall not need to look far for reasons: bearing in mind that in addition to the permanent attractions of Blackpool the famous Illuminations will be in progress at the time.

* * *

The conference will open on Thursday, September 21st, and will finish at noon on Saturday the 23rd. Headquarters, at which the meetings will be held, will be the Cliffs Hotel, facing the sea on the North Shore cliffs. Special terms have been arranged and this early opportunity is taken for urging that reservations be made in good time. A reception and welcome by the Mayor of Blackpool (Alderman W. R. Duckworth, J.P., M.P.) will be given at the hotel on the Thursday evening, and the meetings will take place on Friday morning and afternoon and Saturday morning. No arrangements are being made for a tour on the



M. & R. Saidman, Blackpool

The Society opens its Conference
at Blackpool on September 21st

C O M M E

Saturday afternoon as it is thought that members and delegates will prefer a half-day holiday. There is something for all tastes and temperaments in Blackpool.

* * *

Details of the conference papers will be announced later, but the main subjects to be discussed are: "The Importance of Clean Air to Health Resorts"; "The Position of Local Authorities in Relation to Smoke Abatement"; and a report and discussion on the economic aspects of smoke with special reference to the need for new and extensive inquiries. In addition, although it is rather away from our subject, every member present, and especially those concerned with civic enterprises, will be interested to hear a short descriptive talk about the Illuminations by Mr. F. W. Field, the Illuminations Engineer.

* * *

Astronomical observations are becoming more difficult in Greenwich, which is an area becoming increasingly urbanised. The Astronomer-Royal recently explained the remarkably serious consequences of air pollution. "We are normally enveloped," he said, "in a pall of smoke and dust, which makes the atmosphere only partially transparent. Even in the matter of sunshine records we lose at least 150 hours every year. It is a case of the sun's rays in winter and early spring coming through the pall so weakened that they cannot act on sensitised paper." Another objection, allied to this, is that improved street lighting and neon signs create too much brightness in the night sky—the light will, of course, be largely reflected and scattered by the particles forming the smoke pall. Shall we have to describe London as the city from which even the stars are hidden?

* * *

We like the story of the new soot test devised and carried out by a reporter of the *Edinburgh Evening Dispatch*. The smoke from the railway alongside the Princes Street Gardens seems often to be in the news, and when a proposal was made to turn part of the

N T A R Y



Capt. Alfred G. Buckham

Edinburgh from the Air: The Princes Street Gardens and railway line are at the bottom left-hand corner

West Gardens into a Lido, it was argued that a soot-sprinkled resort for bathing and sunning was not altogether attractive. To examine these allegations of sootiness, the reporter visited the gardens, equipped with a new white handkerchief and a sheaf of white paper. In his amusing account of his experiment he says that while "a knot of honest Edinburgh matrons, with perambulators, looked on with a gaze of mingled concern and pity," he spread out his white handkerchief on the grass and gingerly sat himself upon it, keeping a wary eye open for sabotage-suspecting keepers. It was in February, and when, "with what amounted to a slight feeling of coldness," and to the great relief of the curious bystanders, he arose, examination showed that the underside of the handkerchief was smudged with soot. Several sheets of paper tested in the same way each gave the same result. The case was proved: soot lay on the grass on which, if the Lido came, tired swimmers and decorative sunbathers, women in white frocks and men in white ducks, would unwittingly recline. May we hope that

the members of the Standing Conference on the Investigation of Atmospheric Pollution will decide individually to test the efficacy of this method?

* * *

Smoke abatement arguments seem to be creeping into the newspaper advertisement columns. It is, for example, interesting to note that a preparation for the cleaning of wall papers is marketed under the appropriate name of "Smoky City" Wall Paper Cleaner. Another advertisement is in the form of a dialogue which starts: "'Well,' said the sweep, 'there's your chimney clean and sweet again. And not before time, if I may say so.' The lady sighed. 'I know,' she said. 'The carpet is just ingrained with smoke. It must go to the cleaners.' 'Which'll cost a fortune,' replied the sweep, 'apart from the inconvenience of taking it up . . .'", etc. He goes on to tell her about an easier method of cleaning carpets, but we, chivalrously, are more concerned with the fact that the shocking state of her carpet should have caused the lady to sigh so despondently. Perhaps we may offer here "The Smokeless Home," or "Britain's Burning Shame," singing, "Sigh no more, lady, sigh no more, Smuts were deceivers ever . . ."

* * *

It is a pity that space does not allow us to print in full the address by Mr. Gustave Agate to the North-Western Branch, which is reported on another page. In any case, it was clearly an address that should have been heard rather than read, for it is full of wit and scintillations that lose much in cold print. What must be recorded, without fail, is the reference to his own smoke abatement cartoon showing the Lady Mayoress of Manchester as Snow White scrubbing her seven dwarfs, Smoky, Sooty, Grimy, Filthy, Smutty, Ricketty, and Lousy.

* * *

Mr. A. T. S. McGhie, LL.B., has been appointed as Assistant Secretary to the Society. This new post has been made necessary by the increasing amount of work now being done at headquarters, including the publishing of this magazine, the advertising department of which is in charge of Mr. McGhie.

* * *

This issue, it may interest readers to know, contains more pages, more reading matter, and more advertisements than any previous issue of the Journal. The paid and subscribed circulation is also at a new high level.

Reporting Progress

Contributions from the representative associations of the industries assisting smoke abatement

COAL INDUSTRY

THE engineers of the Coal Utilisation Council continue their valuable work of practical smoke abatement. The following are recent examples of the services they are rendering to consumers—and to the community—in this direction.

At a large store on the South Coast, whose chimneys overlook the laboratories of the city analyst where important testing work is carried out, smoke emission was found to be caused mainly by faulty operation of the draught controls, which the operator kept fully closed. The C.U.C. engineer demonstrated the correct operation of the boiler dampers and then found that the boiler was still heavily overloaded at certain periods. Having conducted experiments with the air supply, he was able to overcome the trouble completely.

At a factory in London, on the other hand, the smoke was caused by a lack of load upon the boiler plant; the small fuel consumption on a large grate area leading to a low furnace temperature. Here the recommendation was that the grates be shortened in order to provide a hotter fire and an increased rate of burning per square foot of grate area.

At a bleaching works in Lancashire it was found that certain portions of the plant were run at night with the furnaces banked. This not only gave very poor furnace efficiency but caused a heavy accumulation of soot, which was blown about when the forced-draught fan was started in the morning. Here again, the remedy lay in correcting the combustion conditions by shortening the grates.

Complaints of smoke emission had been received at a large dairy in Essex and the local fuel supplier asked the C.U.C. to investigate. The Council's engineer found that the trouble was caused by the low rate of combustion in the furnace, careless operation of the forced-draught system and a widely fluctuating demand for steam. Recommendations were made for putting matters right.

Also at the request of the fuel supplier, an investigation was made into a complaint of smoke at a well-

known brewery. It was found that the smoke only appeared when a separate furnace for heating a copper pan was brought into operation. The flue from this furnace led into the same stack as the two Lancashire boilers, and the C.U.C. engineer immediately diagnosed insufficient draught, due to overloading, as the cause of the trouble. He accordingly urged the head brewer to instal an induced-draught fan, to which the brewer replied that he had already received this advice from the furnace manufacturer. Having obtained confirmation from an independent source, however, he now felt at liberty to recommend his directors to sanction the necessary expenditure.

So the good work goes on; not spectacular perhaps, but of real practical value in reducing smoke and promoting efficiency.

GAS INDUSTRY

Smoke abatement loomed large in the discussions at the annual conference of the British Commercial Gas Association at Brighton.

In speeches and debate the Gas Industry's thoroughgoing support of the smoke abatement movement was made clear. Guests, too, joined in emphasising the need for vigorous action and added encouraging words of commendation of the service this industry can provide, and is providing, in the fight against smoke.

Sir Harold Hartley, chairman of the Fuel Research Board, in a striking paper on "The Conservation of the Nation's Resources," said:

"... gas and coke between them can supply the fuel needs of almost every type of establishment, while at the same time rendering a great service to the community by helping to produce a smokeless atmosphere."

And:

"The basis of the Industry is the scientific use of a single raw material—coal—in order to derive the maximum advantages from it. A comparison with the burning of raw coal shows not only a saving of material, but a service which has added enormously to the standard of comfort, cleanliness, and hygiene in the home, a reduction of the smoke problem in great cities, and a recovery of large quantities of chemicals essential to the industries of this country. For all these reasons the carbonizing industry must form a permanent part of our industrial fabric."

Lord Horder, in a paper on "Heat, Health and Happiness," congratulated the Industry on Kensal

House, the smokeless housing block in North London, and went on to say :

“ The evils that follow the pouring out of carbon and sulphuric acid into the atmosphere—and here again we must remember our humid climate, which greatly intensifies these evils—are familiar to us all. And there are the enormous economic losses, too, entailed by fog and dirt, though these are not my concern as a doctor. Whether these nuisances are, in the gross, caused more by industrial or by domestic fires (concerning which there is much argument) doesn't affect the position much.

“ The fact remains that you are making a large contribution towards keeping the air pure by supplying to the people fuel that has none of these evils debited to its account.”

So much for Brighton.

There is more news of the growth of the Kensal House idea—which by the use of gas and coke gives a complete and smokeless fuel system, from instantaneous hot water on tap to bedroom fires, at less cost than the old-type, smoke-creating fuel service.

Now the L.C.C. is experimenting on Kensal House lines on a large scale ; ten large private building estates have adopted the Kensal House plan in its entirety ; and some of the most important features have been incorporated in housing schemes under the aegis of the Borough Councils of Chelsea, Paddington, Stoke Newington, Islington and Westminster.

ELECTRICAL INDUSTRY

Although the domestic chimney is admittedly the greatest source of smoke pollution in this country, by far the most marked and easily criticised cause of it has been, traditionally, the smoke-stacks of our great industrial areas. Such captions as the “ Black Country ” denote the menace of careless coal-powered industrialisation far more readily to the general public than statistics of the comparative damage done by industry and the domestic grate.

Possibly for this reason, among others, tremendous progress has been made within the last few years towards abating or removing the damage done by large-scale users of coal and steam in industry.

A comparison of the older industrial districts of the North of England or the Midlands with the new factory communities that have sprung up round London and the Home Counties, reveals at once a marked difference in atmosphere : the difference between the old-fashioned use of coal-power and the modern employment of electric power : the difference

between slag heaps and slums and smoke-palls and healthy sports grounds and gardens.

The extent to which this change-over generally has come about in the past decade or so is possibly not fully realised.

In point of fact, in 1930, public supply electricity provided about 35 per cent. of the total power of the country !

The generation figures for electricity in that year were nearly 11,000 million units. To-day they are in the region of 24,000 million units . . . over double the output in nine years !

Assuming the power output of this country has risen, it cannot have done so at such a rate as to have doubled itself, and the proportion of 35 per cent. must be held to have increased considerably—possibly, indeed, to as much as 50 per cent.

The effect of this turn-over to clean methods of employing power must be tremendous in the reduction of smoke pollution. Indeed, it is now recognised that from this point of view, the modern factory community is far less of a menace, either real or apparent, than the ordinary housing estate.

Excluding traction, lighting and domestic consumption, we find that about 22 per cent. of the total national power output in 1920 was public supply electricity used in works and factories of this country.

The total electric drive in industry is now 50 per cent. greater than all other power applied directly, although in 1924 it was slightly less.

This growth is probably the most outstanding feature in the progress of the electrical industry to-day. Between 50 and 60 per cent. of the total units of electricity sold to-day are sold for power. And there are besides, particularly in the textile and mining industries, very large private generation plants which take very little power from public supply mains but which are all contributing towards the ideal of the all-electric industrial system.

Perhaps the latest epitome of what all-electric industry will eventually be like is given in the recent complete conversion to electric power in the great Wedgwood pottery factory in Staffordshire, the heart of the ceramic industry and the “ Black Country ” of Arnold Bennett.

This new pottery is all-electric, combining decorating, glaze firing and biscuit firing in one complete conversion. The result has been a clean, “ garden-village ” type of factory which has set a brave example to the rest of the Potteries and which, it is hoped, they and other industrialists will not be long in following in the interests of cleanliness and smoke abatement.

News and Reviews

Smoke Film Competition

Those of our readers who are amateur cinematographers will be doubly interested in a new competition for films on smoke abatement, organised by the monthly magazine *Home Movies* and the Society. One of the Society's big needs is to have money enough for a first-class film, but with such a subject it is possible for really effective work to be done by the amateur at little cost. That, anyhow, is what we are hoping for, and it will be extremely interesting to see what the many enthusiastic film-makers make of a subject that simply cries out loud for cinematic treatment. The current issue of *Home Movies* gives full particulars of the competition and an article outlines the approaches that may be made. The Society is providing prize money totalling £40, and will have the right to copy and use as it wishes all films for which awards are made. The judges will be Mr. Paul Rotha, whose name is famous in the world of documentaries, the Editor of *Home Movies*, and a representative of the Society. If you are not a film-maker yourself encourage any friends who are to enter a competition that will give them a unique opportunity of showing their skill and imagination.

New Trade Publications

"Flats" is the title of a beautifully produced and lavishly illustrated book of nearly 300 pages published by *Ascot Gas Water Heaters Ltd.* Much general information in the building, design, and equipment of flats (including A.R.P.) is given, and illustrated with excellent photographs and plans. The use of water heaters, although fully described, is really a subordinate part of the book, which will be found to be of considerable interest to builders, architects, municipal housing officers, and to anyone who lives, or contemplates living, in a flat. The Ascot Company should be congratulated upon its contributions to book production and general knowledge almost as much as upon its contribution to the supply of hot water.

Smoke abatement is a key point in a descriptive illustrated brochure on "Phurnod," the Welsh smokeless coal marketed by *Powell Duffryn Associated Collieries Ltd.* The fuel is dealt with from the domestic point of view and a series of questions and answers describe the different grades of the fuel and their particular uses.

The automatic stoker is becoming more and more widely used in installations for central heating and hot

water supply systems. A booklet giving the essential information about these appliances is published by *Automatic Stoker Installations Ltd.*, of 36-38 Victoria Street, London, S.W.1. This firm of specialists does not manufacture stokers, nor is it interested in any particular make, but "gives unbiased advice on the service to be obtained from the different automatic firing methods now available (mechanical stokers, magazine boilers, gravity-fed burners, etc.), and on the selection and installation of such equipment."

The Lea Recorder Co. Ltd., of Manchester, have issued a brochure on a new type of their patent coal meter to be used for measuring the amount of coal consumed by all types of boilers operated by screw-type mechanical stokers. The value of such meters, which measure coal consumption by volume and give direct readings in cubic feet, pounds, or any other unit of volume or weight, with automatic stoking installation, hardly needs stressing.

"This Made a New World" is the title of an attractive little booklet issued by the *British Commercial Gas Association*. With drawings, photographs, and a simply-written text, it describes the story of town gas and includes brief descriptions of the nature and uses of the principal by-products of carbonisation. The booklet should enjoy a wide circulation and may be obtained from the Association's Offices at Gas Industry House, Grosvenor Place, London, S.W.1.

Britain's Health

The P E P report on this subject, which has already been reviewed in these pages with special reference to its mention of the smoke problem, has now been issued, in condensed form, as a Penguin Special. All who are interested in the health services and the general position in this country of the prevention and cure of disease and the maintenance of health, and who could not afford the large volume as first issued, can be recommended to expend a sixpence required for this shorter report. Lord Horder contributes an important foreword.

Boiler House Practice

This is the title of a thorough and well-balanced text-book by E. Pull, published by the Technical Press Ltd. (6s.). It covers the syllabus of the City and Guilds Examination on this subject, but apart from its use by students it will be found to be a useful general handbook for the smoke abatement worker who wishes to obtain a general knowledge of the subject.



Part of
The Hall of Residence

TEACHING CLEAN AIR

A. Margaret Kaye, Senior Lecturer in Housewifery at the Gloucestershire Training College of Domestic Science, describes how smoke abatement is stressed at the college and put into practice in the Hall of Residence

TO the majority of people the name of Gloucester conjures up a vision of a quiet Cathedral city set in a fertile plain surrounded by the beautiful Cotswold hills and Cotswold country. It is not always realised that Gloucester is also an exceedingly busy and rapidly expanding city of some 52,937 inhabitants, engaged in many occupations. Many factories are situated in and around the city, producing goods varying from carpets to matches, from toys to pins. It is also a port, and has busy dock and dockyards. On the outskirts of the city are huge food storage buildings, aerodromes, both civil and military, and factories for the construction of aeroplanes and their various parts.

Not least amongst these centres of activity is the Gloucestershire Training College of Domestic Science, which since its foundation in 1891 has offered a choice of courses which have attracted a wide variety of students.

The Gloucestershire Training College is affiliated to the Bristol University, which grants a degree in Domestic Science through a course lasting four years, or five if the student wishes to qualify as a Graduate Teacher, and take the Diploma in Education. The Teacher Training Course explains itself, and lasts for three years. Another course lasting four terms and known as the Institutional Management Course fits students to earn their living in a large number of capacities in various types of Institutions. Housekeepers' courses are also available for those who wish

to fit themselves for independence as working housekeepers, and finally the Household Management Course is one which prepares students for home life.

In all this work the College has always inculcated modern ideas, progressive schemes and modern methods, particularly those which will benefit the housewife individually and the community as a whole. Amongst these has been a consideration of smokeless fuels, and smoke abatement.

Laundrywork, housewifery and hygiene form part of every course, the amount of time given to the subjects varying with the length of training. Science forms an important part of the Degree and Teacher Training Courses. In all these courses consideration is given to atmospheric pollution, to smoke abatement and to the use of smokeless fuels, the various types at present on the market, their cost, etc. In laundrywork the detrimental effect of the polluted air on personal clothes and household fabrics is stressed. In housewifery the disadvantages of dirt-producing fuels and the expense and labour involved in using them is considered and discussed as is the psychological effect of living in dirty surroundings and the ultimate mental and physical ill-health which results. In Hygiene lectures attention is given to the detrimental effects of a smoke-laden atmosphere on the health of the individual and the community. A very good illustration of these lectures can be gained from a nearby and easily accessible hill—Cooper's Hill—from which it is possible to look down on to Gloucester, which is

always seen enveloped in a pall of smoke. This view the students frequently encounter as they walk or bicycle in the country, and it is thus very easy for them to realise the truth of what is said in the lectures.

Practical Application

Apart from a theoretical consideration of the advantages of smokeless methods and smoke abatement, the students live with an actual practical application of these ideas. Some years ago the old-fashioned arrangement of small, inconvenient and scattered hostels for the students was abandoned, and a Hall of Residence built, in which the students are given the opportunity to live lives of ordered comfort and health in surroundings which achieve beauty in simplicity and demand the minimum of service.

From the inception of the idea the Principal intended that all the open fires in the building—in the Common Room, the Sick Bay, the rooms used by the Warden, the Resident Tutors, and members of the House-Staff—should all be fuelled with smokeless fuel as proof of its value to the community, and as a gesture towards minimising the pollution of the air. The students thus gain a very practical knowledge of this type of fuel—they handle it, use it for laying and lighting fires, and warm themselves by its glowing radiance. Various societies form part of the social life of the college—societies which are organised by the students. To these societies many eminent Guest Lecturers have spoken, amongst whom was Dr. Margaret Fishenden, who gave a very interesting illustrated lecture on smoke abatement.

From this short description it can be seen that the Gloucestershire Training College of Domestic Science is doing its quota towards making at least one section of Society become "Clean Air Minded" with the hope that this country will soon become in reality "a green and pleasant land."

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THE NATIONAL SMOKE ABATEMENT SOCIETY.

President: H. A. Des Voeux, M.D.; Chairman: Charles Gandy; Hon. Treasurer: Will Melland, M.A., J.P.; Hon. Advisory Secretary: Sir Lawrence Chubb; General Secretary and Editor: Arnold Marsh, M.Sc.Tech., M.Inst.F.

Another Burning Shame!



A Wilhelmina Cartoon, by Lees, reproduced by permission of the "Daily Express."

NEWS FROM THE REGIONAL COMMITTEES

Mr. Elliot and Mr. Morrison—Important report on Sheffield's Smoke

Greater London

At a meeting of the Greater London Advisory Council for Smoke Abatement held at the Ministry of Health on 29th March, a constitution was submitted and adopted. The meeting was addressed by Mr. Walter Elliot, M.P., Minister of Health, and by Mr. Herbert Morrison, M.P., Leader of the London County Council.

Mr. Elliot said that, although parts of London were non-industrial, they suffered from their neighbours' smoke. Even apart from their neighbours' smoke, those residential parts had their own special problem in the form of domestic smoke. Although they might be far from realising the architectural vision of fireless housing, he was convinced that, with energy and application in the presentation of their ideas and policy, the Advisory Council would gradually bring them nearer that ideal.

Mr. Elliot hoped that the membership of the Council would quickly grow to full representation of the 100 or so local authorities comprised in the Metropolitan Police District which the Council had adopted as their area.

Mr. Morrison said that over all the 100 authorities there hung the same smoke pall, and joint action was essential if they were to make headway. The problem fell into two parts. There was the question of smoke from factory and trade premises. Here they had power to make by-laws to control the emission of smoke. There was also the question of smoke from the domestic chimney, which was more difficult. Domestic smoke caused two-thirds, or even three-quarters, of the smoke damage in London because of its particularly harmful composition.

In the absence of compulsory powers they could tackle the question, continued Mr. Morrison, by setting good examples as landlords and by a wide co-operative propaganda campaign. The London County Council were doing everything in their power to discover practical means of turning London into a smokeless city.

Mr. E. H. Keeling, M.P., Chairman, presided at the meeting. Mr. C. W. Gibson, L.C.C., was elected vice-chairman; Dr. J. B. Howell, M.O.H. for

Hammersmith, was elected hon. treasurer; Mr. A. R. Wood, Comptroller of the L.C.C., was elected hon. auditor; and as a mark of esteem for his services to smoke abatement in London, Dr. Des Voeux was elected to the position of "hon. librarian."

Over 60 authorities have now become members of the Council.

Manchester and District

The proposal to form a Joint Smoke Abatement Board for South-East Lancashire has now reached a more definite stage but the present situation, involving much urgent work for local authorities, is delaying progress. So far twenty-two authorities have agreed to become members of the Board, and a meeting of representatives of such authorities was held in November, 1938. At this meeting a committee was formed for the purpose of preparing a draft scheme for submission to the authorities concerned. It is hoped that a number of other authorities who are considering the matter will agree to join before the draft order is submitted to the Ministry of Health.

A report of the Honorary Secretary gives the following details of courses held at the Manchester Municipal College of Technology during the session 1937-38.

Sixty-one students enrolled for the course. Of these forty-nine sat for the examination, thirty-five of whom satisfied the examiners and were awarded certificates by the Regional Committee.

This elementary course was originally arranged at the instance of the Regional Committee who have a high regard for their value in the training of boiler firemen for the more efficient working of boiler plants. In addition to the elementary classes more advanced courses were held, particulars of which are as follows: 2nd year course: 76 students enrolled, 41 sat for the examination, 35 of whom satisfied the examiners. 3rd year course: 14 students enrolled, 6 sat for the examination, 5 of whom satisfied the examiners.

An examination in boiler house practice under the auspices of the City and Guilds of London Institute was also held. Thirty students sat for this examination. Of these eight obtained first class passes, eleven second class passes, and eleven failed.

A course of lectures and demonstrations in Fuel Economy and Smoke Abatement was also held at Warrington under the auspices of the Health Committee.

The Midlands

On the 27th February, 1939, representatives of the subscribing Local Authorities visited the Salvage Department's premises in Montague Street, Birmingham, where Dr. W. Weaver, Chief Chemist to the Department, demonstrated the Organic Digester and Chlorination Plant by means of which offal, vegetable waste and condemned meat are treated and rendered innocuous.

Through the courtesy of the Lord Mayor, Alderman J. Crump, J.P., a luncheon was held in the Banquet Hall, The Council House, Birmingham, the Council thereafter visiting the Engineering section of the British Industries Fair, Castle Bromwich, where much of interest from the point of view of combustion was demonstrated.

Dr. Martine (Birmingham), Honorary Secretary, reports that the number of affiliated Local Authorities is now 38; that 16 students completed the Smoke Inspector's course this winter at the Birmingham Central Technical College, and that Mr. G. W. Farquharson (Birmingham), member of the Council's Executive Committee, had been invited to join the Royal Sanitary Institute's Panel of Examiners for the Smoke Inspector's Certificate.

Consultations have recently been arranged by the Honorary Secretary on behalf of several affiliated Authorities, the problems being the question of local opposition to the introduction of Smoke Bye-laws, the most effective means of dealing with the dust nuisance from a "crackerplant," and in one case the elaboration of a complete scheme of prevention of atmospheric pollution in a much industrialised urban district.

A survey is now in progress to test the feeling of the affiliated authorities with regard to the powers given by the Public Health Act, 1936, Section 104 (2), whereby a Local Authority may make Building Bye-laws requiring the provision, in new buildings other than private houses, of such arrangements for heating or cooking as are calculated to prevent or reduce the emission of smoke. In this connection it is of interest to note that no Model Bye-laws have so far been issued by the Ministry of Health.

The preliminary investigations of the British Non-ferrous Metals Research Association have now

been completed in this area with regard to the proposed research into prevention of nuisance from zinc oxide fumes arising from non-ferrous metal processes, and facilities are being given by Local Authorities in the area to further this work.

A deputation from the Manchester Public Health Department came to Birmingham recently on a tour of inspection of new type Cochrane Kirk Boilers which have been installed at large dairy premises in the City. This type of plant has incorporated in it effective dust extractor apparatus.

A Ministry of Health Inquiry was held at Oldbury when objections were heard in relation to a Bye-law made under the Public Health Act, 1936, Section 104 (1). Claims for the exemption of the side fed "blue-brick" kiln were strong and were upheld by the Minister to the extent that such exemption is to be provisional and for one year only, the Local Authority being entitled to claim repeal of the exemption thereafter. Mr. F. Harrold (Oldbury) reports that his Local Authority is well satisfied with the result of the Inquiry.

Sheffield, Rotherham and District

Following a survey of the area by Mr. E. C. Evans, Chief Technical Adviser to the British Iron & Steel Federation, a report was submitted to the Joint Advisory Committee on the "Present Position regarding Smoke Abatement in the Sheffield Metallurgical Trades." This contains many interesting statements showing what has been done in recent years.

Heavy capital expenditure in plant directed to smoke mitigation and control amounts for four firms alone to approximately one million pounds during the past five years. Re-organisation is not yet completed, and it is estimated that a further two to five years will be required for this work.

The rapid substitution of gas for coal firing has increased the demand for coke oven gas from two and a half thousand million cubic feet in 1932 to seven thousand million cubic feet in 1937.

The costs of production have been reduced from 35½ hundredweights of fuel per ton of steel in 1929 to 26.6 cwt. of fuel per ton of steel in 1937, a saving of nearly 25% per ton of finished product. It is stated that the increased steel demand during 1937 necessitated the starting up of old and admittedly inefficient plant, causing an increase in smoke emission, but this position is only temporary and will be rapidly corrected in order to meet the new conditions.

It is claimed that the progress made in smoke abatement has been creditable and that improvement continues with the large firms, but not with the smaller ones. As most of these works are situated in densely populated areas and have low chimneys, much nuisance is caused by volumes of black smoke.

In reviewing economic and technical conditions, it is pointed out that piecemeal modification of plant is not possible, and re-organisation as a whole is the only satisfactory solution at some works.

The supplies of coke oven gas are only limited and are wholly inadequate to meet the present needs of the metallurgical industries in the district, the seven thousand million cubic feet already stated being the equivalent of only 6% of the coal used in the industry. Producer gas is used to some extent in the larger works and its extended use can be anticipated, but not in the small works. Liquid and pulverised fuels are of limited application owing to the added cost. In discussing the problem of the small producers, it is stated that solid fuel will remain the principal one in use, and although mechanical stoking has been tried it has not always proved successful. Any modification in present practice must ensure uniform quality and output if it is to be carried out. A special recommendation is put forward for further education of furnace operators on the lines already in operation by the Smoke Abatement Committee, which is one of the most pressing needs in the area.

Dealing with technical problems, it is stated that smokeless combustion cannot be claimed for every process, but that the "Reducing" atmosphere necessity is not so pronounced as some manufacturers insist it shall be. An appeal is made for technical advice on a broader scale for the small works, with interchange of methods of working. Tribute is paid to the assistance already given in this respect by the Smoke Abatement Officers. It is suggested that progress would be accelerated by periodic consultations between a Technical Officer representing the manufacturers and the Smoke Inspector at the works where problems have arisen. In concluding, a special plea is put forward for co-operation, which has already achieved a great deal and is the only effective method of securing progressive improvement.

Mr. Law's Reply

Replying to this Report, the Chief Smoke Inspector, Mr. James Law, states that there are a number of discrepancies to which exception must be taken.

To state that expenditure incurred by four firms for

smoke abatement purposes approximates one million pounds is neither truthful nor fair. The expenditure was made primarily to increase output and quality, and in doing so the emission of smoke has been reduced. The fact that there was a saving of nearly 25% in fuel costs, as stated in the report, emphasises this point.

With regard to increased smoke due to the starting up of old and admittedly inefficient plant, it is stated that advantage was taken of the "Gentleman's Agreement" not to prosecute, in order to increase the steel output. Dealing with economic and technical problems, it is pointed out that manufacturers have now the necessary capital to improve their plant, and that the old slogan, "that steel cannot be produced without smoke," is non-existent. For every process in steel manufacture there is ample evidence that smoke can be kept within the "prescribed standard."

The figures shown with regard to the use of coke oven gas are not accepted and other figures are given in strong contrast to those submitted. With regard to the use of other fuels, it is stated that there should not be any difficulty in looking for substitutes for raw coal if the manufacturer desires to do so.

It is stated that there is a vast amount of reconstruction work to be done, but there are many manufacturers who will not do anything until they are compelled.

Alternative Action

Alternative actions are submitted, the first, to insist on the removal of the provisional exemption from the Public Health Act, and continued co-operation, so that pressure can be brought to bear on offenders who will not re-construct, and the second, to leave the exemption in the Statute Book, cease co-operation and prosecute the offending companies.

In conclusion, it is stated that progress has been made at many works, but it is realised that the rate of progress is much too slow and needs accelerating.

At a special meeting held on March 7th, 1939, the Report and the reply to the same were considered. This can be considered one of the most important meetings that has yet taken place, and has brought this long-standing question yet a step nearer solution.

It has been agreed that for twelve months no action shall take place, but that a list of offending works shall be submitted and that the Manufacturers' Association shall bring pressure to bear on the firms concerned. It was not agreed, however, that if the Association failed in their efforts the Smoke Abatement Committee should take proceedings, but that further consideration be given at the end of that period.

The Second Article of the
series for the general reader

AN OUTLINE OF SMOKE ABATEMENT

II. *Smoke in the Air*

THE last article showed how smoke was formed and how it was discharged into the atmosphere to the extent of about nine million tons, or three million tons of soot, a year. The heavier particles are deposited fairly quickly, but the smaller the particle the longer will it remain suspended in the air, and weeks may elapse before the most minute particles settle out. Some of the evil consequences of smoke are due to effects when it is deposited, but others, perhaps the more serious, are caused by the soot and acid while it is suspended in the atmosphere.

The gaseous constituents of smoke are usually dispersed freely through the atmosphere and have no appreciable effects, but the solid or oily particles tend to form a haze or pall which is very evident when from a hill or aeroplane it is possible to look down over a town. From the town itself, looking upwards to the bright sky, it is not easy to appreciate the presence of the pall, except perhaps immediately after entering the town from the country, when a dimness or diminution of the strength of the sun's rays is at once apparent. The obstruction of daylight is one of the most important factors in this question, and it is caused mainly by the finer particles.

As much as 60 per cent. by weight of the particles have a radius of from 1 to $10\mu^*$, but the numbers are relatively small. Smaller particles in the range 0.3 to 0.1μ are present to the extent of about 2,000 particles per cubic centimetre, and a still smaller group, perhaps of 0.03μ radius, which are detectable only with the aid of the ultra-microscope, are present to the extent of 30,000 to the cubic centimetre. The last, and even smaller particles, form a very small proportion of the total mass of impurity and it is an open question whether their presence is harmful. (*Cf.* Whytlaw-Gray, Leeds Conf. Proc., N.S.A.S., 1937).

Measuring the Suspended Impurity

The review of the Atmospheric Pollution report in this issue mentions the automatic filter. This is one of the most useful of the instruments used, for it gives us a knowledge of the amounts of matter suspended



The Automatic Filter, showing one of the printed filter discs, around the edge of which spots are produced as air is drawn through the paper

in the air by automatically taking a reading every fifteen minutes or so. A measured volume of outside air is drawn along a narrow tube and is forced through a circular filter paper so that the impurities are deposited on the paper and appear as a small discoloured spot. The actual amount can be estimated by comparison with a set of standard shades. After a given period the filter paper, which is rotated by a clockwork mechanism, moves round a little, and the automatic suction part of the apparatus then draws the same quantity of air through the paper and so produces a new spot adjacent to the first. At the end of 24 hours there is a circle of spots, each opposite its appropriate time, as may be seen from one of the illustrations.

The record of the concentration of impurity can be plotted against time in graph form, and then clearly

* μ $\frac{1}{1000}$ millimetre, or about $\frac{1}{25000}$ inch.

shows how this rises and falls with unfailing regularity. There are several examples of such graphs in the new Atmospheric Pollution report. The extent of pollution is at a minimum during the early hours of the morning, until about 6 or 7 o'clock, after which it starts rapidly to increase, and reaches a maximum between 9 and 11 a.m. Then, as a rule, there is a gradual fall with another, but less pronounced, rise in the late afternoon or early evening.

On Sundays the rising morning curve is usually rather less steep, and, for reasons that are obvious to all who are aware of the Sunday habits of the majority of people, begins about two hours later than the weekday curve.

The weekday concentration is due to industrial and domestic smoke together, and that on Sunday to domestic smoke only (including hotels, etc.). This gives a measure of the relative proportions of the two types of smoke, and shows, for example, that in London 68 per cent. of the smoke is of domestic origin.

The Drift of Smoke

A future article on smoke and fog will show how under certain conditions, the smoke remains stationary and concentrated over a town. Normally, however, although the pall is most dense immediately above the chimneys, it rises to considerable heights and may drift long distances across the country. The smoke cloud from industrial cities has been observed from an aeroplane at a height of 8,500 feet, and there is a great deal of evidence to show the remarkable distances that a smoke cloud can travel and yet remain sufficiently dense to be identified as smoke.

Air pilots observe smoke from the "Black Country" when over southern Yorkshire, and haze due to London's smoke is occasionally met over the Channel some miles from the Kent coast, and even over northern France. Similarly, with easterly winds, smoke haze from the industrial districts of Germany is carried over southern England.

Meteorological observers at Valencia Island, off the south-western coast of Eire, have written of the adverse effects upon visibility of pollution from the English industrial centres, 350 miles away.

The Obstruction of Light

The loss of daylight, direct sunlight, and ultra-violet light caused by the smoke pall is due to the smaller particles which scatter and absorb the light rays. There are several ways of measuring the intensity of both visible and ultra-violet light: by chemical action, by the degree of fading of a coloured liquid, or by the



Another view of the Automatic Filter showing a filter disc being inserted. The clockwork mechanism which rotates the paper once in 24 hours is seen beneath the operator's left hand

action upon sensitised paper, as in photography.

Observations taken simultaneously in a smoky town and outside it invariably show a loss of light in the towns. This is frequently very considerable, and, for example, the average of several years' observations in Manchester and an outer suburb showed, for one district, a loss of 61 per cent. of the available light. The average loss was 45 per cent. In the winter months the city of London receives only one-half the light recorded at Kew—which in its turn probably loses an appreciable amount.

The quantity of light lost differs little in summer and winter, but as the winter light is comparatively so weak the proportion then lost is much greater and more noticeable, especially on days having a smoke haze. It is interesting to note that a well-known photographic exposure guide recommends that the calculated exposure should be *doubled* in a large or smoky town, even if the sun is apparently shining brightly. This confirms, from entirely different observations and experiences, that fact that the light over our towns has only about half the intensity it should have. This is not usually appreciated because of the remarkable powers of adaptability to varying light conditions possessed by the eye.

SMOKE—

justified by fuel costs?

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